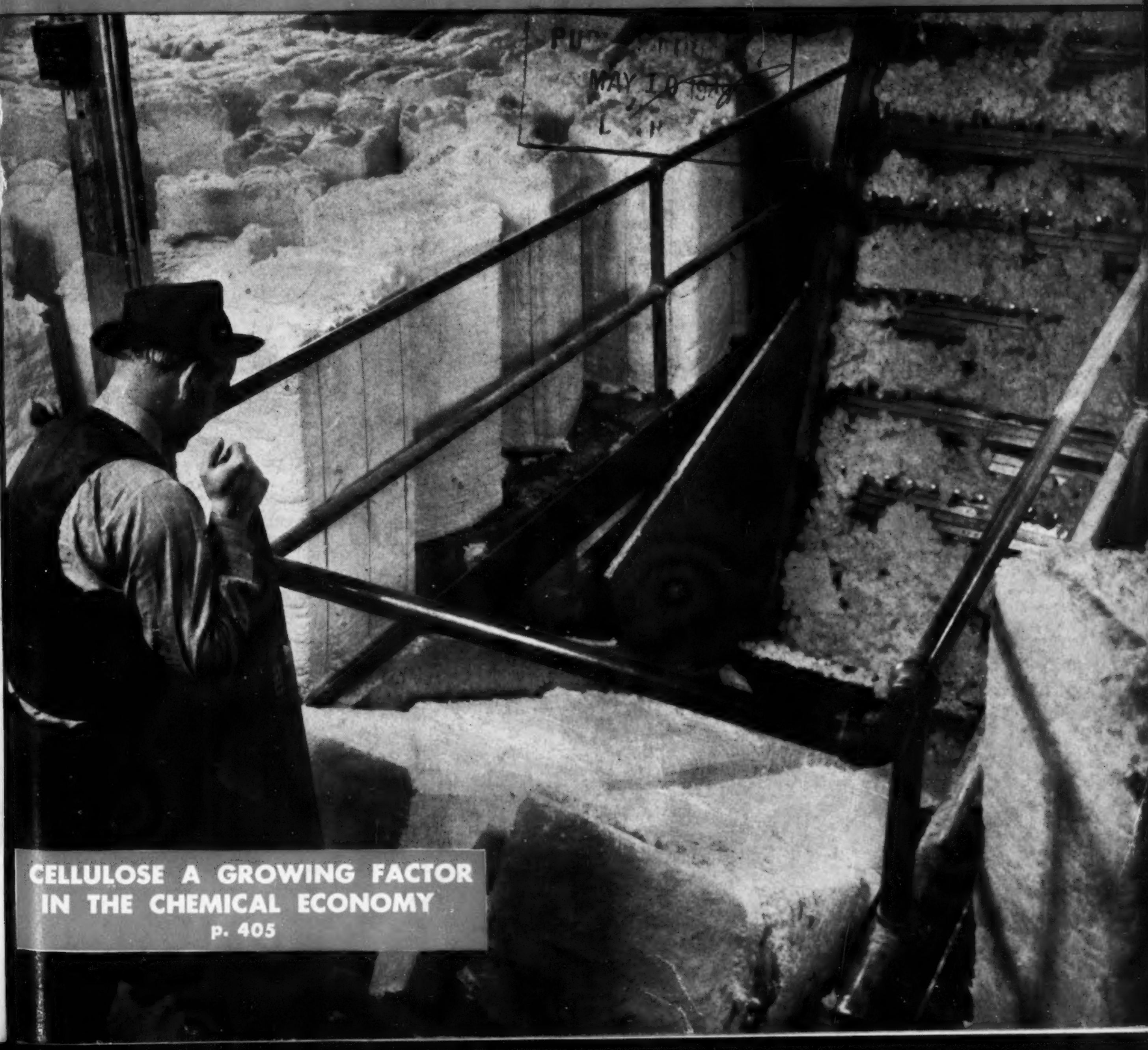
March 1948

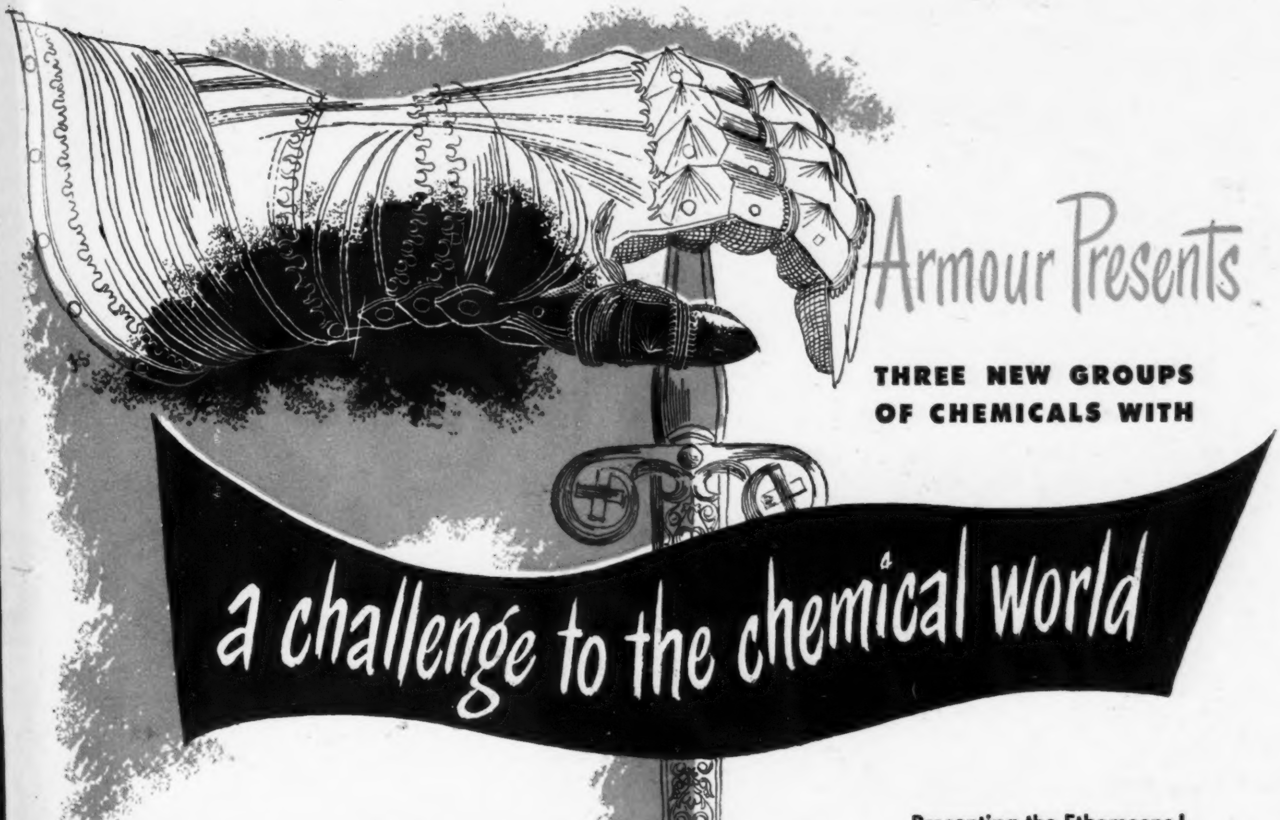
Chemical Industries

IN THIS ISSUE



CELLULOSE A GROWING FACTOR IN THE CHEMICAL ECONOMY

p. 405



New chemicals are always a challenge to the industrial chemist — a stimulating challenge to examine, to modify — and, finally, to adapt.

Particularly challenging are the three new chemical groups Armour now presents for your investigation: the Ethomeens, the Ethomids, and the Ethofats. So far, these cationic and non-ionic chemicals have proven themselves particularly valuable as wetting agents, detergents, emulsifiers (and emulsion-breakers), and as chemical intermediates. But very frankly, Armour feels that these uses merely skim the surface of their industrial possibilities — especially considering that some forty basic products (each in a wide range of solubilities) can be produced in commercial quantities.

A booklet on the Ethomeens, Ethomids and Ethofats is available upon request. It describes the general characteristics and properties of these surface-active chemicals, plus their known and indicated uses. Also included is a complete product listing from which samples may be requested for laboratory testing. ACCEPT THE CHALLENGE TODAY!

ARMOUR
Chemical
DIVISION

1355 West 31st Street
Chicago 9, Illinois

Presenting the Ethomeens!

The Ethomeens, a series of related chemicals made from the Armeens (Armour's fatty amines) are cationic in character and can be made with varying degrees of cationic tendencies. The Ethomeens are stable to hydrolysis in all concentrations of acids and bases. Indicated uses: as germicides, as wetting agents, as detergents in acid solutions, as waxes, as emulsifiers.

Presenting the Ethomids!

The Ethomids are a group of chemicals made from the Armids (Armour's fatty amides) and, being non-ionic in character, are compatible with anionic, cationic and non-ionic surface active materials. The Ethomids tend to be more stable to hydrolysis than the Ethofats in medium concentrations of acids and bases. Indicated uses: as detergents, as emulsifying agents, as wetting agents, as waxes, as dispersing agents.

Presenting the Ethofats!

The Ethofats are chemicals prepared from the Neo-Fats (Armour's fatty acids) and are also non-ionic in character. They are stable in mild acids and bases. The Ethofats are excellent non-sudsing detergents (even for cottons) and can be built with alkaline salts. Other indicated uses: as emulsifiers, as stabilizers in the compounding of natural and synthetic latex, as wetting agents, as detergents in dry cleaning solutions.

MAIL THIS COUPON TODAY!
(Attach to your business letterhead, please)
ARMOUR CHEMICAL DIVISION
1355 West 31st Street — Chicago 9, Illinois
Please send me the new booklet on
The Ethomeens, Ethomids and Ethofats
Name..*Title*..............
Firm..
Address..
City...................................*Zone*......*State*...........

isn't that the Mathieson Plant?

"It's one of them, Mr. Jones—the Niagara Falls plant."

Yes, Mr. Jones and there's another at Saltville, Va., to serve the southeast, and a third at Lake Charles, La., serving the southwest. With three plants, Mathieson offers triple flexibility in deliveries of caustic soda. Call it three sources of supply. That's why weather, breakdowns, railroad or labor conditions seldom keep Mathieson from making prompt deliveries.

The Mathieson Alkali Works (Inc.), 60 East 42nd Street, New York 17, N.Y.

Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine . . . Chlorine Dioxide Ammonia, Anhydrous & Aqua . . . HTH Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate.

Mathieson
CHEMICALS

Chemical Industries

"SERVING THE CHEMICAL PROCESS INDUSTRIES"

VOLUME 62—NUMBER 3 **MARCH, 1948**

DEPARTMENTS

NEWS OF THE MONTH

Cover: Celanese Corp. of America

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Published monthly, at 1309 Noble St., Philadelphia 23, Pa., and entered as 2nd class matter July 15, 1944, at the Post Office at Philadelphia 4, Pa., under the Act of March 3, 1879. Subscription $5 a year, $8 for two years, $10 for 3 years. Add $2 per year for postage to Latin America. Other foreign rates, except Canada, $15 one year, $30 for 3 years. Single copies 60c, except special issues. Canadian subscriptions and remittances may be sent in Canadian funds to Chemical Industries, P. O. Box 100, Terminal A, Toronto, Canada.

Murray Hill 2-7888. Horace T. Hunter, President; John R. Thompson, Vice President and Treasurer; J. L. Frazier, Secretary. OFFICE OF PUBLICATION: 1309 Noble Street, Philadelphia 23, Pa. EDITORIAL & EXECUTIVE OFFICES: 522 Fifth Ave., New York 18, Murray Hill 2-7888. DISTRICT OFFICES: Chicago: 309 West Jackson Boulevard, Chicago 6, Ill., Harrison 7890. Los Angeles: 420 Halliburton Bldg., 1709 W. 8th St., Los Angeles 14, Calif., Mutual 8512. San Francisco: 68 Post St., San Francisco 4, Calif., Yukon 1069. London: Sun Life of Canada Bldg., Trafalgar Square, London, S. W. 1, England.
A MACLEAN-HUNTER publication. Horace T. Hunter, President

THE READER WRITES

Chemical Prices Too Low?

To the Editor of Chemical Industries:

I have heard it expressed frequently in yours and other chemical publications that we must keep chemical prices down, that real prosperity comes from low prices and increased production.

That is an admirable theory, but I am just wondering if the chemical industry is suffering today from an overdose of the "keep prices down" philosophy. When you keep prices below the point necessary to replace plants or build new ones, those prices are too low. Maybe we would have fewer shortages of chemicals today if some producers were not wedded to price structures that are antiquated on the basis of today's costs.

J. C. STILLWATER
Stillwater Chemical Co.
Chicago, Ill.

Readable Nomographs

To the Editor of Chemical Industries:

I should like to commend your publication on the very excellent manner in which its "Nomographs-of-the-Month" are presented. Unlike many others that appear in the technical press, your nomographs are clear enough and large enough to facilitate easy reading.

C. J. MAJOR
Wyandotte, Mich.

White Dye

To the Editor of Chemical Industries:

The September issue of your publication contains two articles in which we are particularly interested. One is by B. L. West on dyes, in which he makes reference to a "white dye," and the other is by D. A. Neidig which mentions the use of lithium hypochlorite as a bleach.

We would like to know the manufacturers and/or sources of supply of these materials and where we might obtain further information on them.

A. J. SANDERS
Roux Laboratories, Inc.
New York, N. Y.

Any readers desiring further information about the "white dye" mentioned by Dr. West can obtain same by writing to him at the Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J. Further information on lithium hypochlorite as a bleach can be obtained from the Solvay Sales Corp., 40 Rector St., New York, N. Y.—EDITOR.

Likes Annual Surveys

To the Editor of Chemical Industries:

Please keep up the good work on your annual surveys of new chemicals and new equipment. They serve a definite need, and the one this September was especially well done.

CHARLES W. H. MILMER
Chemical Engineer
754 Garrod Ave.
Buffalo, N. Y.

Hydrazine Hydrate

To the Editor of Chemical Industries:

On page 424 of your journal for March, 1946, there is an article entitled, "Hydrazine Hydrate: War Baby or Chemical Intermediate?" In it the statement is made that hydrazine hydrate is now being prepared commercially in the United States. Can you give us the name of the manufacturer or manufacturers?

ROBERT W. SHORTRIDGE
Midwest Research Institute
Kansas City, Mo.

Hydrazine hydrate is made by the Fairmount Chemical Co., 136 Liberty St., New York 6, N. Y.—EDITOR.

New Remedy for Athlete's Foot

To the Editor of Chemical Industries:

We have read with great interest th article on page 714 of your October, 1 issue entitled "New Remedy for Athlete's Foot. Can you give us the address of the maker of this new product?

W. L. SAVELL
Remington, Rand, Inc.
South Norwalk, Conn.

Scape, the new remedy for athlete's foot described in our October issue, is made by Georges Bean Pharmacal Co., 60 E. 42nd St., New York, N. Y.—EDITOR.

Fifth Wheels Not Useless

To the Editor of Chemical Industries:

I was amused at the reference in "We—Editorially Speaking" in your September 1947 issue to the "useless" fifth wheel.

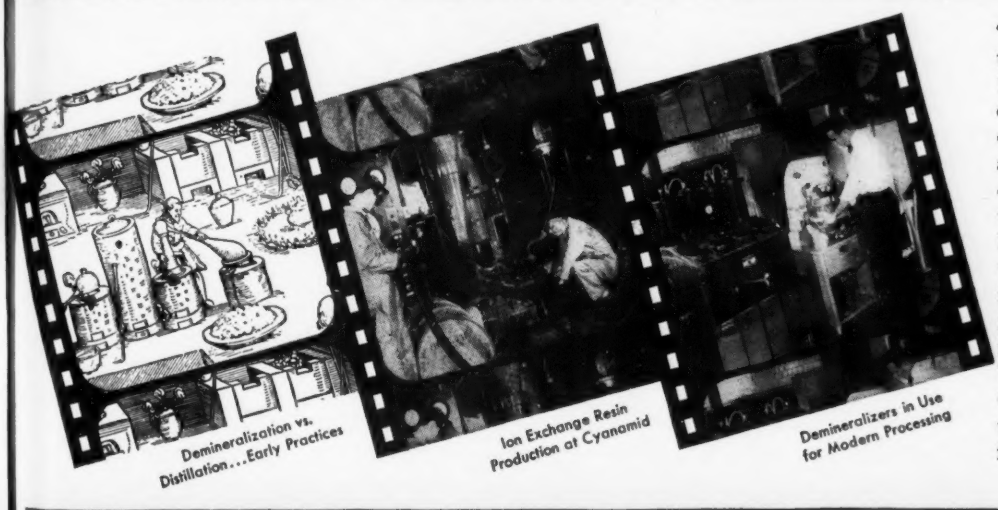
On my desk at home is a model of a Fifth Wheel which comprises an improvement made by my father years ago. For years he made and also sold Fifth Wheels. The Fifth Wheel was a great improvement to the wagon or carriage and not a "useless appendage." It may only be half or three quarters of a wheel instead of a complete wheel, which may have confused your writer when he took a wagon apart looking for this item. As a youngster, I helped make thousands of "Fifth Wheels." They were hardly "useless."

RESEARCH DIRECTOR

Chemical Newsfront

EARTH AS GOOD AS YOU MAKE IT

"Humus," the farmers call it, but in everyday parlance humus is that vital portion of the soil which increases water-holding capacity, serves as a storehouse of readily available plant food, and improves the tilth of the soil, enabling it to produce bumper crops year after year. Since barnyard manure is no longer available in sufficient amounts, many farmers now plant and plow under special "cover crops" or utilize crop wastes like stubble, straw or cornstalks to replenish the humus content. And when AERO* CYANAMID nitrogen-lime fertilizer is applied at the time of plowing under, it does three important things: it speeds conversion of the cover crop or crop wastes into better quality humus; it increases the amount of humus formed from any given tonnage of organic material; and it aids the following crop through the lime and nitrogen which it provides.



"WATER, WATER EVERYWHERE" is the title of a new Cyanamid 16 mm. sound film in color. It describes in detail the ion exchange process which produces a low-cost chemical equivalent of distilled water, showing what ion exchange resins are, how they work and the advantages of demineralization in various industries. It runs for twenty-three minutes and is available without charge. Write American Cyanamid Company, Ion Exchange Products Department, 30 Rockefeller Plaza, New York 20, N. Y.

*Reg. U. S. Pat. Off.

AMERICAN **Cyanamid** COMPANY

30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

DOUBLE CHECKED FROM RESEARCH TO INDUSTRY

SHARPLES

DIBUTYLAMINE

$(C_4H_9)_2NH$

Dibutylamine undergoes reactions typical of secondary amines with aldehydes, ketones, oxides, phosgene, carbon disulfide, chlorohydrins, cyanates and thiocyanates.

Among its applications are its uses as an intermediate for:

- DYESTUFFS
- CORROSION INHIBITORS
- FLOTATION REAGENTS
- RUBBER VULCANIZATION ACCELERATORS

SPECIFICATIONS

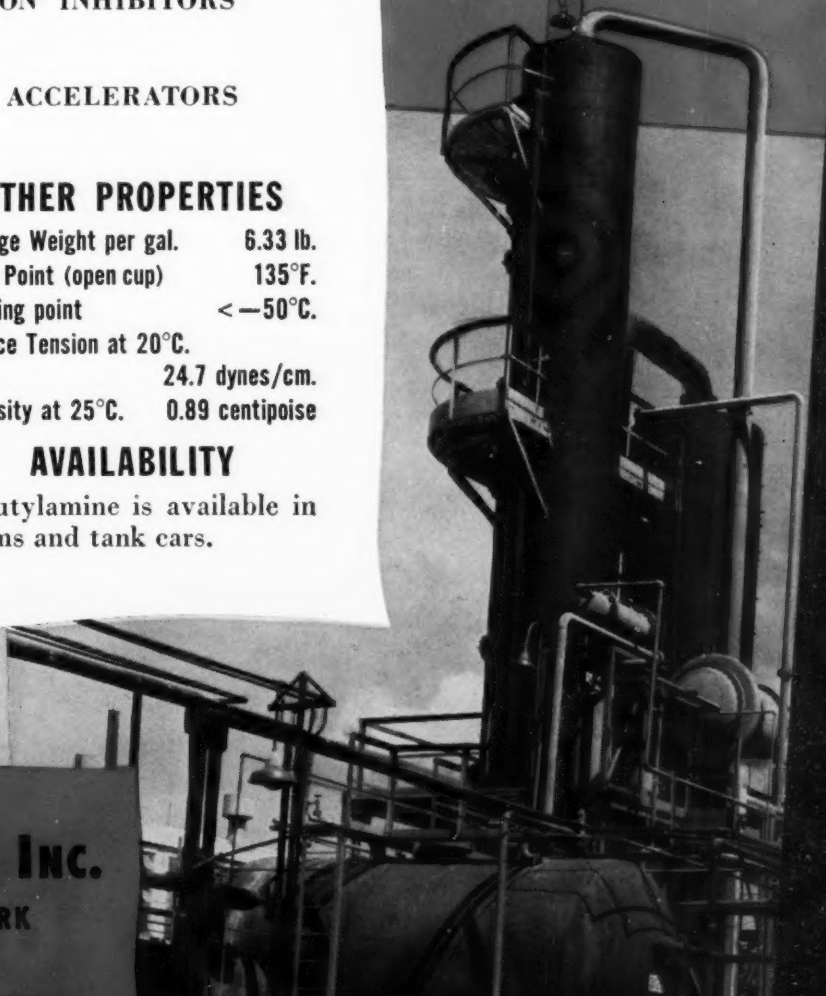
Color	Water-white
Specific Gravity at 20°/20°C.	0.76
Acid Insolubles	Max. 0.16%
Dibutylamine Content	Min. 98%
Distillation:	
Initial boiling point	Min. 154°C.
Not less than 95%	Below 161°C.
Not less than 97%	Below 162.5°C.
Final boiling point	Max. 167°C.

OTHER PROPERTIES

Average Weight per gal.	6.33 lb.
Flash Point (open cup)	135°F.
Freezing point	<−50°C.
Surface Tension at 20°C.	24.7 dynes/cm.
Viscosity at 25°C.	0.89 centipoise

AVAILABILITY

Dibutylamine is available in drums and tank cars.



SHARPLES CHEMICALS INC.

PHILADELPHIA CHICAGO NEW YORK

SHARPLES TRADE MARK CHEMICALS

Surface Tension:

	Ultrawet K	Ultrawet 30K	Ultrawet SK
Concentration @ .001 wt. %	48.0 dynes/cm.	64.4 dynes/cm.	58.8 dynes/cm.
@ .005 wt. %	34.8 "	41.1 "	42.0 "
@ .01 wt. %	29.0 "	33.4 "	32.9 "
@ .05 wt. %	27.3 "	28.2 "	27.9 "
@ .10 wt. %	26.7 "	27.4 "	27.1 "
@ .50 wt. %	27.0 "	26.9 "	26.8 "

Draves Wetting Times Test:

Concentration @ .05 wt. %	35 sec.	—	300 sec.
@ .10 wt. %	8.2 "	265 sec.	35 "
@ .20 wt. %	4.0 "	21 "	11.6 "
@ .50 wt. %	2.6 "	5.8 "	4.4 "

Ross-Miles Foam Test:

Concentration @ .05 wt. %	116 mm.	89 mm.	98 mm.
@ .10 wt. %	132 "	105 "	121 "
@ .20 wt. %	148 "	127 "	136 "
@ .50 wt. %	161 "	142 "	154 "

(*Note:* Surface Tension, Draves Wetting Test and Ross-Miles Foam Test are conducted at 75° F. and Ultrawet K's solutions were made up using water with a hardness of 100 p.p.m. Draves Wetting Test run with 1.5 g. hook.)

FOR CHEMICAL-RESISTANT RESINS

USE FURFURYL ALCOHOL

● Furfuryl alcohol (FA), in the presence of an acid catalyst, yields a liquid resin which when converted to the infusible state is remarkably inert to solvents, alkalies and most acids. Liquid resins of this type, filled with inorganic materials and further catalyzed, form resin cements which cure at room temperature.

● By reacting phenol and FA, alkali resistant resins may be prepared which cure with heat and hexamethylenetetramine. Other reactions of FA which result in formation of resins having chemical resistivity include condensation with formaldehyde, and phenolic resins. Reaction of neutralized FA-acid catalyzed resin with phenol or phenolic resins also produces interesting products.

● Lending support to the value of investigating FA are its ready availability in tank car lots, and the downward trend of its price. *During 1947 the price of almost all chemicals increased sharply. FA was reduced in price.*

● Quaker Oats Technical Staff is ready to help you evaluate FA and to that end offers bulletins which may assist you. Write on your letterhead for a sample of FA and any of the following bulletins you would like to have.

QO CHEMICALS

TABLE OF PROPERTIES

Boiling Point (pure) 764mm	175-7°C
Specific Gravity (20/20°C)	1.1339
Freezing Point	-31°C
Color	Amber
Flash Point (Open cup)	75°C

BULLETIN 83A	Furfuryl Alcohol, General
BULLETIN 90A-11	Bibliography of Furfuryl Alcohol Resin Literature
BULLETIN 108	Furfuryl Alcohol-Acid Catalyzed Resins
BULLETIN 110	New Resins From Furan Compounds

The Quaker Oats Company CHEMICALS DEPT.

1920 C BOARD OF TRADE BLDG.
141 W. JACKSON BLVD., CHICAGO 4, ILLINOIS

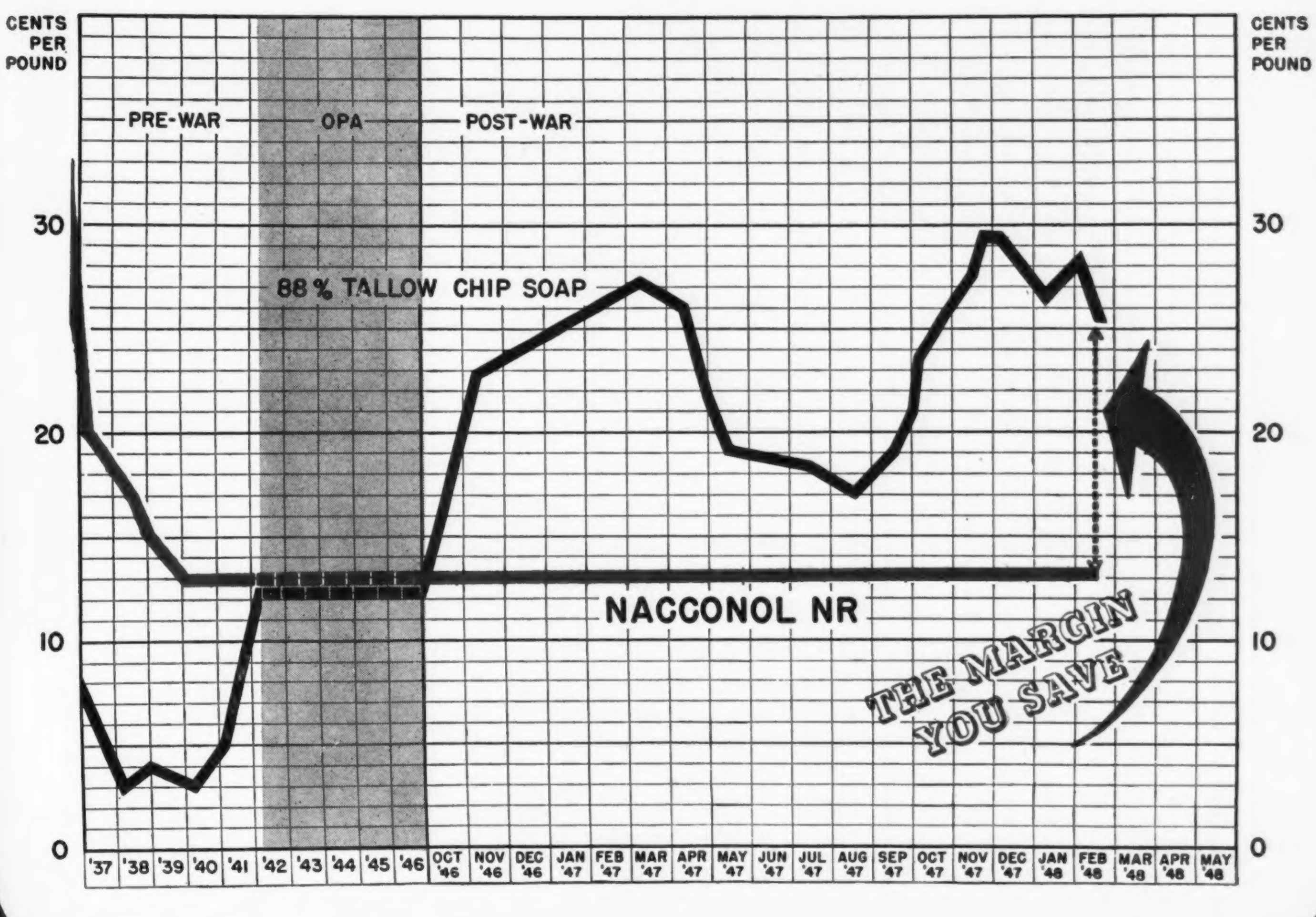
EASTERN SALES OFFICE, 1232 C WHITEHALL BLDG., 17 BATTERY PLACE, NEW YORK 4, N. Y.

In the United Kingdom, Quaker Oats Ltd., Southall, Middlesex, England In Australia, Swift & Company, Pty. Ltd., Sydney
In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S.A., 42, Rue Pasquier, Paris 8E, France

FURFURAL • FURFURYL ALCOHOL (FA) • FUROIC ACID • TETRAHYDROFURFURYL ALCOHOL (THFA)

Pictures Speak Louder Than Words

COST COMPARISON - NACCONOL NR vs SOAP



Reg. U. S. Pat. Off.

Adopt NACCONOL NR
and cut your soap costs

National Aniline DIVISION • ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR ST., NEW YORK 6, N.Y. • BOSTON • PROVIDENCE • PHILADELPHIA • CHICAGO • SAN FRANCISCO • PORTLAND, ORE.
GREENSBORO • CHARLOTTE • ATLANTA • NEW ORLEANS • CHATTANOOGA • TORONTO

Copper Chloride

for Gasoline Sweetening

available in 3 types

2 H_2O Crystal
Dried 1½ H_2O Crystal
Anhydrous

Immediately Available from Stocks

For your gasoline sweetening process, specify Harshaw Copper (Cupric) Chloride. The long list of satisfied refineries using Harshaw Copper Chloride is in itself a recommendation of this highly efficient material.

Three types are available . . .

Copper Chloride 2 H_2O Crystal — 35.8% Cu (Typical)

Copper Chloride 1½ H_2O Dried Crystal — 39.6% Cu (Typical)

Copper Chloride Anhydrous — 46.5% Cu (Typical) . . .

Choose the one best suited to your needs.

All are immediately available from conveniently located stocks. Contact the Harshaw branch office nearest to you for your requirements.

CHICAGO • CINCINNATI • DETROIT • HOUSTON
LOS ANGELES • PHILADELPHIA • PITTSBURGH • NEW YORK

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Investigate

Cowles DRYMET*

DRYMET is commercial anhydrous sodium metasilicate. DRYMET contains no water—combined or uncombined. It is the most highly concentrated form of metasilicate on the market.

DRYMET yields more chemical value per pound than other detergent silicates—and it is priced to yield more chemical value per dollar.

DRYMET is readily soluble in all practical concentrations at all practical temperatures.

DRYMET has a total alkalinity as Na_2O of not less than 50%.

DRYMET yields a pH of 11.55 in a .06% solution. DRYMET will improve the detergent efficiency of practically every alkaline solution.

Write for DRYMET File Folder containing complete technical information and suggested formulations.

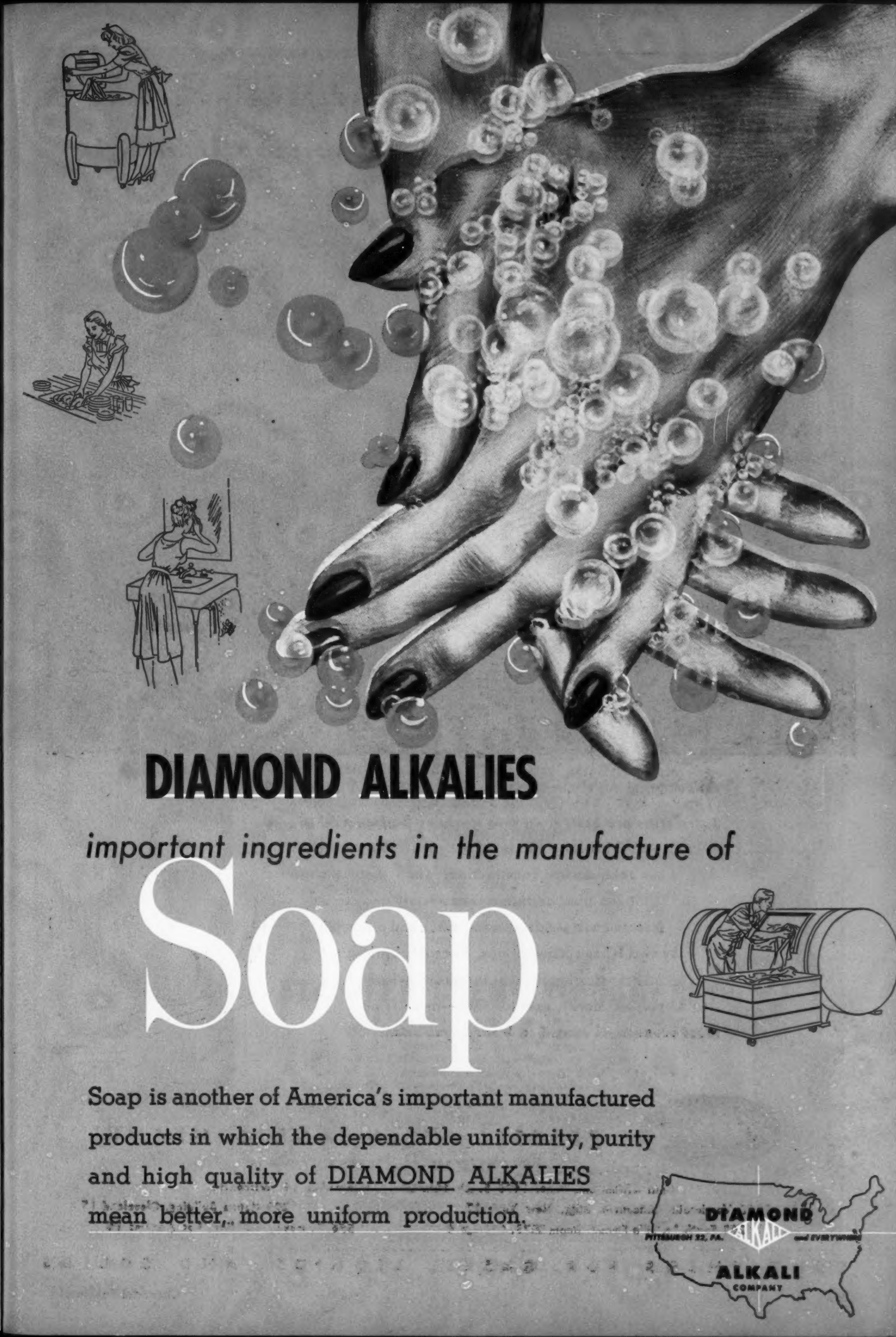
*Reg. U. S. Pat. Off.

DRYMET *is available for immediate shipment.*

The Cowles Detergent Company

HEAVY CHEMICALS DEPARTMENT

7012 EUCLID AVENUE • CLEVELAND 3, OHIO


DIAMOND ALKALIES
important ingredients in the manufacture of
Soap
Soap is another of America's important manufactured products in which the dependable uniformity, purity and high quality of DIAMOND ALKALIES mean better, more uniform production.
DIAMOND
PITTSBURGH 22, PA.
and EVERYWHERE
ALKALI
COMPANY

ONYX IONICS

March — Newsworthy Items for Technologists and Production Men — 1948

NEW DEVELOPMENTS

For Further Details Write Onyx

High Molecular Dialkyl Dimethyl Ammonium Bromide is one of a number of quaternaries produced by Onyx in commercial quantities. If you are interested in any of the more unusual "quats," investigate their availability in the Onyx line. No. 17

•

Ever Try to Make a Bilge Cleaner? The job of bilge cleaning is unusually messy, unpleasant and costly. Yet Neutronyx 834, with safety solvent, makes a very effective bilge cleaning solution to be sprayed on and then flushed off with water. No. 18

•

Effective Conditioner for Paper Mill Felts is NSAE Powder. It makes an anionic surface-active solution with excellent wetting and penetrating properties, not only for reconditioning felts, but for breaking in new felts. No. 19

•

Cationic Germicide for Cold Sanitization of Surgical Instruments. One of the many results of close production control to insure maximum germicidal activity in Onyx BTC is its ability to sterilize surgical instruments in cold solution without dependence on heat. No. 20

NSAE Powder Provides Wetting and Penetrating Action in Acid Solutions

This effective wetting, penetrating and dispersing agent is outstanding in its stability in dilute organic and mineral acids.

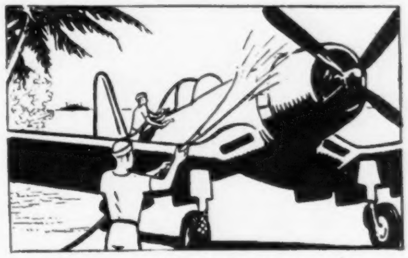
A highly satisfactory spreading and dispersing agent for insecticides

Combining in one compound the action of an emulsifier, penetrant and dispersing agent, NSAE Powder has many interesting possibilities for use in metal cleaning compounds, cleaners for washing fruits and vegetables, and in pickling and electroplating solutions. It is an excellent spreading and dispersing agent in the production of insecticides and fungicides.

Broadly Compatible Non-Ionic Emulsifying, Dispersing Agent and Detergent

The Neutronyx Series of non-ionic surface-active agents offers interesting possibilities in the compounding of many industrial products. Unusually effective as emulsifying and dispersing agents, the members of this family possess highly useful detergent properties, particularly where good wetting action is wanted, combined with solubilizing and emulsifying action *in the presence of salt water, hard water, electrolytes and anionic or cationic surface-active agents.*

The series includes Neutronyx 330, 331, 332, 333, 560 and 834, each of which has varying individual characteristics, but all of which are applicable to the uses outlined herewith.



Makes an excellent cleaner for greasy dirt with organic solvents

Suggested Uses of Neutronyx

Emulsifying and dispersing agents in leather degreasing and fat liquoring; insecticides; cosmetics; industrial cleaners.

Detergents for salt water operations. In combination with organic solvents to make fast, effective cleaning solutions for greasy dirts as found in automotive, diesel and airplane engines and in the manufacture of metal products.

Compatible emulsifying and dispersing agent for cosmetics

Foaming agent in making foam rubber.

We are interested in other potential uses of Neutronyx which may occur to you. Tell us your ideas so that we can recommend the most suitable Neutronyx for testing.

• • •

Onyx Resin Dispersions Have Many Industrial Uses

Onyx produces a number of water dispersions of thermoplastic resins, which are in extensive use in textile finishing. These same dispersions are of considerable interest to non-textile users. They do not deteriorate or putrefy on standing, or after application. They are stable, non-toxic and non-inflammable.

These resin dispersions have shown much promise in leather finishing to reduce "crocking" of pigments. Most of them can be compounded into coatings by the use of plasticizers. Flexible, glossy coatings for leather and paper are among the possibilities.

If you have any ideas for the use of these dispersions for coating, stiffening, impregnating and similar purposes, we shall be glad to cooperate in exploring the possibilities involved.

Anionic Penetrant and Dispersant with Unusual Foaming Properties

Maprofix NEU is one of the most potent of modern synthetic detergents, with effective wetting action available over practically the entire pH scale. Foam is unusually large in volume with extraordinary persistency.

Maprofix NEU offers material advantages in compounding cleaners for carpets and rugs, and for metal products. It makes an excellent dispersing agent in paint, pigment and rubber, insecticide, shampoo and cosmetic production. It has also shown good results in the de-inking of paper.

Maprofix NEU makes an unusually effective dispersant in paint production.

onyx SPECIAL CHEMICALS FOR INDUSTRY

ONYX OIL & CHEMICAL COMPANY
JERSEY CITY 2, N. J.
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In Canada: Onyx Oil & Chemical Co., Ltd. Montreal, Toronto, St. Johns, Que.

Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

For Your Information:

Newsletter,
March, 1948

Phenol is the chemical to watch. According to an unpublished survey recently made by a manufacturer, based on plants now building and projects known to be in the works, estimated annual capacity by 1949 will be 350-400 million pounds--almost twice the peak wartime output of 205 million pounds a year. (The estimate includes the relatively small amount of natural phenol recovered from coal tar.) Largest producer, then as now, will be Dow Chemical Co.; second, Monsanto Chemical Co.

Shale oil as cheap as petroleum crude is a definite possibility. The Bureau of Mines says that its pilot-plant work, at Rifle, Colo. (CI, February 1948, page 223) indicates that crude shale oil can be produced at \$2-\$2.50 per barrel, including amortization but allowing no profit. More significantly, a large California oil company claims it can do the same for \$1.75, is willing to put up a commercial plant if the government will ante part of the money. That cost is in line with current crude prices: \$1.85-\$2.75.

* * * * *

General Chemical Division of Allied Chemical & Dye Corp. is building a plant at Baton Rouge, La., for the manufacture of Genetrons 100 and 101 (ethylidene fluoride and difluorochloromethyl methane), refrigerants and aerosol propellents. Also under consideration are direct chlorination of ethylene to vinyl chloride and manufacture of trifluorochloroethylene, the polymer of which is a Teflon-like plastic. General Chemical is also planning construction of a multi-million-dollar plant on a recently-purchased 28-acre site at Tonawanda, N. Y.

A new producer of polyvinyl chloride is now in the initial production stage; Glenn L. Martin Co. has started up its Marvinol plant at Painesville, Ohio. Martin is making vinyl chloride monomer by hydrochlorination of carbide-derived acetylene.

A fossil resin similar to kauri is now being produced from Utah coal by Combined Metals Reduction Co. The resin (which comprises 5% of the coal) is concentrated by flotation to 70%. Final purification, to 99.9%, is accomplished by a process developed by Interchemical Corp., the R-B-H Dispersions Division of which markets the material.

* * * * *

Late news about Copolymer Corp.'s "cold rubber" (CI Newsletters, November 1947 and February 1948): The first commercial batch came out of Copolymer's Baton Rouge plant late last month, and the eight small rubber companies who are backing

the corporation are planning to incorporate it into tire tread stocks this year. A major rubber company tested the 40 F. material, reported substantially more than the 40% improvement over natural rubber reported last month. Other tests give widely varying results, but all give the new rubber no. 1 position. For the keen competition of synthetics vs. natural, many rubber men feel "this is it."

There are still some kinks to work out: The polymerization reaction is highly exothermic, refrigeration requirements are large. Some feel that continuous polymerization--where the mass of material to be cooled at one time is not so great--is the ultimate answer. In any event, you can look for Rubber Reserve Corp. to put more money into the development after a few months--after production difficulties have been solved in the course of present-scale operations.

* * * * *

Suppliers of chemicals to the rayon industry can gauge future sales from a study, made by Oscar Kohorn & Co., New York, of projected plant expansion programs by rayon manufacturers. It is estimated that total U. S. rayon production will increase from 959 million pounds in 1947 to 1,080 million pounds in 1950. This, concludes the study, "is plainly inadequate as a long-term solution to rayon yarn and staple shortages. Current demand is far in excess of what producers can offer over the next few years."

It hasn't been announced yet, but a paint manufacturer will soon make and market Gelva paint, Shawinigan Products Corp.'s water-mix vinyl acetate coating developed in conjunction with Foster D. Snell, Inc. Important selling points, says Shawinigan, are no odor, quick dry, washability, and durability equal to conventional oil paints. Targets for initial sales efforts will be hospitals, hotels, food-handling establishments.

Synthetic detergents are still making significant news: A sizable portion of Hercules Powder Co.'s output of hydroabietyl alcohol (CI, December 1947, page 974) may be sold as raw material for a new detergent. Lever Bros. is now buying alkylbenzene, will soon come out with a heavy-duty, alkyl aryl sulfonate-type detergent to compete with Procter & Gamble's Tide. The laundry utility of Tide, incidentally, is due in part to its content of carboxymethylcellulose and phosphate builders. A possible competitor for CMC as a detergent aid is methylcellulose; investigations now under way show considerable promise.

* * * * *

Here and There:

Pigment makers are keenly watching the development of four-color newspaper printing. Of the 1,000 presses now on order by the nation's newspapers, about 900 will include color equipment ... Sulfonyl halides produced by the Reed reaction (as used by Du Pont for sulfochlorination of hydrocarbons) are useful as tanning agents ... Industrial Rayon Corp. has hired an outstanding polymer chemist on a 4-year contract to continue its long-term project for developing a nylon competitor ... One major phthalic producer estimates that current demand is about 30% in excess of current production ... Newport Industries' new plant at Oakdale, Fla., is now operating, but still not at capacity. Its new continuous process for rosin and turpentine ran into initial difficulties, is now running smoothly ... An activated carbon manufacturer fears the effect of the tariff cut (from 45% to 25% ad valorem) on domestic production. The new rate went into effect January 1 ... Casco Products Corp., Bridgeport, Conn., has entered the aerosol insecticide field. The formula will contain U. S. I.'s Pyrenone, a combination of pyrethrum with piperonyl butoxide.

The Editors

Editorial

MORE FOR LESS

by ROBERT L. TAYLOR, Editor

YOU'D HAVE A HARD TIME CONVINCING a lot of people in the chemical industry today that there is a recession just around the corner. As this is being written, dye intermediates are just about as scarce as they have been at any time during or since the war. Buyers are still pleading for caustic soda, aromatic crudes, and some other short items.

Yet, the long wartime and postwar sellers' market on which industry in this country has waxed sleek and fat is showing some definite signs of fatigue. Downward adjustment in prices and volume of consumers' soft goods is already in evidence, and news of dwindling backlogs in important durable goods lines is becoming too frequent to ignore.

Since most companies engaged in chemical processing operations serve principally as suppliers to other industries closer to the consumer, they will of course ultimately be affected by any general decline in consumer buying.

We see no reason, however, why this need be particular cause for alarm. The chemical industry has not had a breathing spell since 1939. During that time it is inevitable that a few things have been put off "until we have more time," that others—especially certain selling and service functions—have been allowed to grow a little rusty through lack of use. Properly anticipated, a moderate decline in demand for chemical products can serve as a strengthening respite and period of consolidation for an industry that over the past eight years has been undergoing the pain and strain of quadrupling itself.

Fence-mending projects in line with their own particular needs are already on the agendas of many chemical company managements for when the lull comes, if not before. Here are a few of a rather general nature that will come in for attention in several companies we know of:

Overall plant efficiency studies, with emphasis on such things as movement of materials, utilization of heat and power, area layouts, safety considerations.

Process studies, including research on yields and efficiencies, possibilities of automatic operation and control, elimination of bottlenecks.

On-the-job refresher courses for operators, maintenance men, supervisors.

Raw materials studies, to review possible alternate sources with regard to price, quality, handling and process requirements.

WHY YOUR ISSUE IS LATE

WE REGRET VERY MUCH that this issue of CHEMICAL INDUSTRIES is late in reaching you. As you may know, our printer is located in Philadelphia, where local members of the International Typographical Union went out on strike last month, without warning, against certain provisions of the Taft-Hartley Act. Fortunately, after some delay, we were successful in making arrangements for CI to be printed in another part of the country for as long as may be necessary, so we believe you can look forward to receiving your future issues on schedule. Our sincere thanks for the understanding and patience you have shown in waiting for your magazine.—ROBERT L. TAYLOR.

Utilization of waste products, either on the premises or outside, through study and evaluation of possible uses and markets.

Consideration of new products which could be added to expand potential sales, utilize other company products or skills.

Review of overall sales program, with an eye to determining most effective balance between sales development, advertising, technical service, salesmen's calls.

Streamlining of selling methods, through sales training courses, realignment of territories, setting of goals in line with accurately determined potentials.

Technical service overhaul to meet competitive conditions, assure most effective use of representatives.

Review of price structures to determine levels at which larger business volume can be obtained from new markets if downward price adjustments occur.

These and other points in the machinery of chemical company operation may well receive special attention over the coming months as demand for more and more chemicals settles down below the supply line. If companies will regard this period as an opportunity to put their houses in order, to oil up the machinery so it will continue to produce more for less, there is no visible reason why the chemical industry cannot continue to look forward to new production peaks and an increasingly important role in our national economy.

What's new

GLYCOL OUTPUT SHOOTS SKYWARD

Thirty years ago ethylene glycol and ethylene oxide were chemical oddities. Today they are among those few organic chemicals whose production is rated in hundreds of millions of pounds, and the end is not yet in sight.

ONE HUNDRED TIMES as much ethylene glycol was produced in 1947 (210,000,000 lbs.) as was produced in 1925, the first year of commercial production. Next year it is estimated that even this large capacity will be at least 50 per cent greater as two new companies enter the field and additional capacity is added to existing plants. This great increase is the direct result of much research, both on uses and methods of production. Three distinctly new processes have been added to the original chlorhydrin process introduced by Carbide and Carbon Chemicals Corp., the first producer. Two are based on the use of petroleum hydrocarbons and one on coal. During this period the price has dropped from 50c to 12c per lb.

The plants of Jefferson Chemical Co., at Port Arthur, Texas, and Wyandotte Chemicals Corp., at Wyandotte, Mich., the two new entries, as well as expansions of the present plants of The Dow Chemical Co. and Carbide will begin operations this year. In addition to its expansion at Freeport, Texas, Dow has completed new facilities at Sarnia, Ontario, to supply the Canadian market. Carbide's expansion is at Texas City, Texas.

There Must Be a Reason

The quantity of glycol used for automobile anti-freeze is still expanding and will soak up the major portion of this production increase. Glycol anti-freeze represented approximately 77 per cent of total U. S. glycol consumption in 1944. Glycol correlatively represented approximately 12 per cent of the total anti-freeze gallonage used in 1931-2, rising to about 23 per cent in 1945-6. It was estimated last month (CI, Feb., 1948, p. 212) that the proportion will reach about 33 per cent of the total used during the coming season. This 33 per cent is equivalent to well over 210,000,000 pounds—equal to 1947 production. As an automobile anti-freeze, glycol possesses a major advantage of permanence over its two major competitors, ethanol and methanol. Its major disadvantage is high cost.

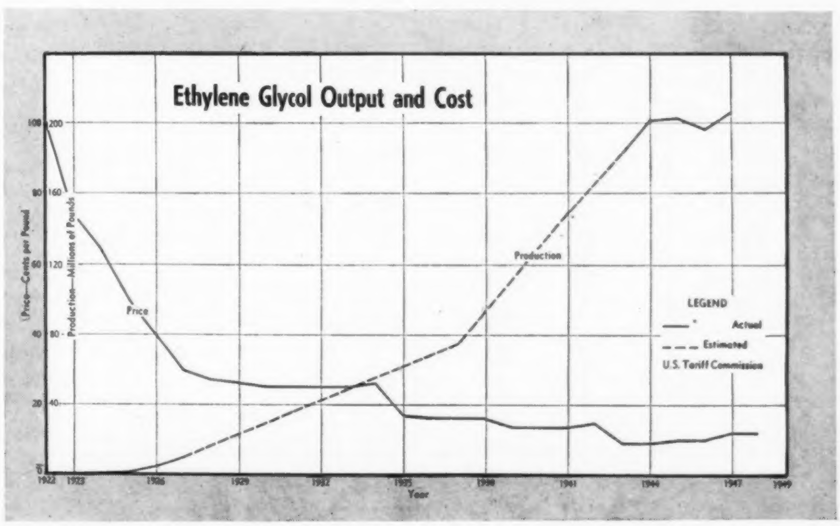
Following exports (17.4 per cent of production in 1945) and falling third in line was the 10 per cent of total output allocated for the manufacture of dinitroglycol for use in dynamite. Here it reduces danger from freezing without reducing effectiveness. Freezing has long been a problem as it makes dynamite much more dangerous to handle. It is questionable whether this use will increase.

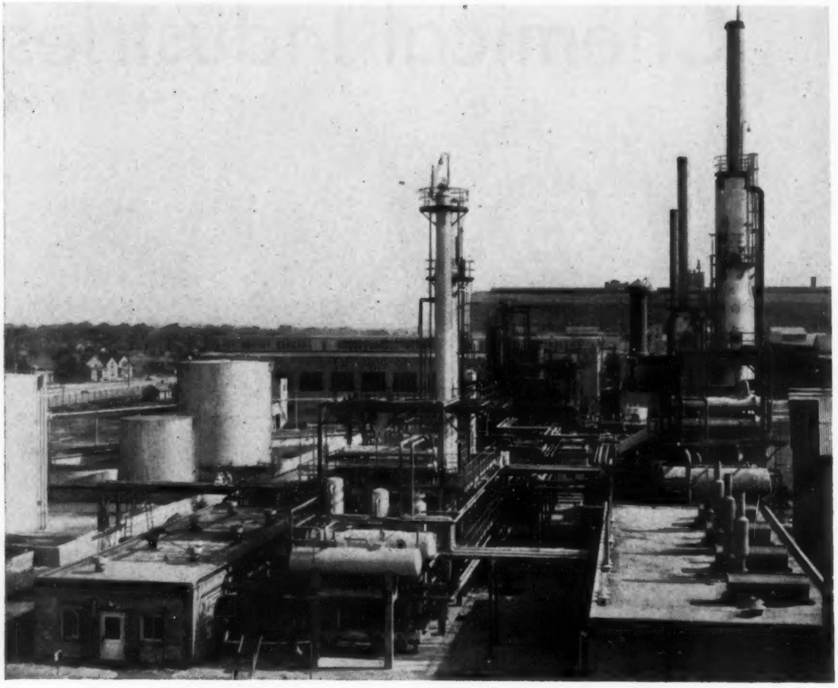
Other new uses promise a still further expansion in glycol demand. Glyoxal, formed by the direct oxidation of ethylene glycol by Carbide (CI, June, 1947, p. 960), is used in Cluett-Peabody Co.'s recently announced Sanforset process for shrinkproofing rayon. Esterification with terephthalic acid produces Terylene (CI, May, 1947, p. 764), a new British fiber. Development of this product is being carried on by E. I. du Pont de Nemours & Co. in the U. S., based on the original work of the Calico Printers Assn. and I.C.I. in England. Both developments promise tonnage markets.

Twenty-Five Years Ago

It was over a quarter of a century ago (1922) that the first pound of chlorhydrin-based ethylene glycol was sold in the U. S. This was marketed by Carbide from its pilot-plant operations at Clendenin, W. Va. Ten thousand pounds were sold that year at $1 per lb. True commercial operation began three years later at S. Charleston, W. Va. In the chlorhydrin process ethylene is reacted with hypochlorous acid. The resulting ethylene chlorhydrin—an appreciable quantity of ethylene dichloride is also formed—is then hydrolyzed with lime.

Any discussion of ethylene glycol must





WYANDOTTE PLANT: The propylene is not excluded.

not overlook its relationship to ethylene oxide. The first production of ethylene oxide was by the reaction of caustic on ethylene chlorhydrin—one step away from chlorhydrin, as is the case for glycol. Today a very large percentage of glycol is being produced via direct hydration of ethylene oxide. Direct catalytic oxidation of ethylene also gives ethylene oxide. Both procedures are now being utilized.

Several years before World War II both U. S. Industrial Alcohol Co. (now U. S. Industrial Chemicals, Inc.) and Carbide began utilization of the direct oxidation process for glycol production. U.S.I.'s ethylene was produced by dehydrating fermentation ethanol; Carbide's, from petroleum sources. This parallel development precipitated one of the most expensive patent fights that the chemical industry has known. Carbide had purchased the Lefort patent (No. 1,998,878) from the original assignee, the Societe Francaise De Catalysee Generalisee, in April, 1936. At Carbide's instigation Lefort procured a reissue patent containing two more claims. These were declared invalid in an infringement suit, and a final decision was not reached until the case had been carried to the U. S. Supreme Court. A second reissue patent was eventually granted, and it was also declared invalid in May, 1946, as the result of a suit in the U. S. District Court. This appears to have settled the argument: Carbide has permitted the time allowed for appeal to elapse.

In the meantime, the cost of molasses had risen so precipitously that USI, as yet, has been unable to use the victory won at so great a cost. However, Carbide is continuing to hydrate ethylene oxide, produced by direct oxidation of ethylene, to ethylene glycol.

In addition to its use as an intermediate for glycol production, ethylene oxide is an important raw material for the chemical industry. Reaction with hydrogen cyanide gives a large portion of U. S. production of acrylonitrile, raw material for Buna-N synthetic rubber, and the new synthetic fibers, Du Pont's Fiber A and Carbide's Vinyon N. Reaction with alkyl phenols and other materials produces the non-ionic polyethylene oxide detergents. The polyethylene glycols are derived from ethylene oxide. Diethylene glycol dinitrate was used in Germany during the war as a nitroglycerin substitute (CI, Oct., 1946, p. 645). Polyglycols are used for Ucon brake fluids and Ucon synthetic lubricants (CI, Oct., 1947, p. 607) for air sterilization (CI, Aug., 1947, p. 207) as an important ingredient in steam set printing inks (CI, June, 1947, p. 943), and for many other uses.

During the USI-Carbide bout, Dow Chemical Co. stepped in with its version of the chlorhydrin process, with plants at both Midland, Mich., and at Freeport, Texas. It has added further capacity since war's end at Freeport and has built a new plant at Sarnia, Ont. to supply Canada.

Glycol from Coal

Petroleum hydrocarbons are not the only raw materials which can be utilized for glycol manufacture. During the wrangling over the Lefort patent, Du Pont was developing a method whereby glycol can be produced from coal.

Du Pont makes formaldehyde from methanol, produced in turn from coal-based water gas. Formaldehyde is reacted at high pressure and temperature with a mixture of carbon monoxide and water to produce glycollic acid (hydroxyacetic acid). This is esterified with methanol and hydrogenated at high pressure to produce ethylene glycol. The methanol is thereby regenerated. This process is in operation at Belle, W. Va.

Wyandotte's process is based on the Barbieri patents. Here the ethylene is not separated from the propylene that forms when propane is cracked. The two react with hypochlorous acid simultaneously and are hydrolyzed simultaneously to form a mixture of propylene and ethylene glycol suitable for use as an anti-freeze.

Jefferson Sticks to Chlorhydrin

Jefferson Chemical Co., recently formed by American Cyanamid Co. and Texas Co., has just completed and is now operating a large glycol and oxide plant at Port Arthur, Texas. Its ethylene is obtained by taking a gas stream from the Texas Co.'s adjacent refinery. These hydrocarbons are further cracked before the ethylene is separated. The chlorhydrin process converts ethylene to glycol.

Starting from a sale of 10,000 lbs. per year, the ethylene glycol-oxide family of products has become one of the most important groups of synthetic organic chemicals. New synthetic fibers, plasticizers, brake fluids, inks, antifreezes, detergents and a host of other uses give promise of an even greater demand in the years to come.

PROTEIN TO WEAR

A fertilizer manufacturer invades the textile field with the first commercial vegetable-protein fiber.

LAST MONTH, on February 17, Virginia-Carolina Chemical Corp. officially made the long straddle from fertilizers to blankets. On that day it consummated the purchase, from National Dairy Products Corp., of the erstwhile Aralac plant at Taftville, Conn., and in three months it will start turning out Vicara, a new protein fiber, commercially.

In its 80 years' existence, Virginia-Carolina has been known almost exclusively as a chemical manufacturer. But in 1939 the company launched a chemurgic research program. It made good sense: The more money farmers have, the more fertilizer they buy; but in order to make money, they have to have dependable markets for their crops. Industrial utilization of agricultural products — chemurgy — looked like the answer.

Proteins Best Bet

Rayon producers and others in related fields had pretty well squeezed out all of cellulose's virtues, and literally thousands were investigating every phase of fat and oil chemistry; so proteins—relatively untouched from the standpoint of industrial utilization—appeared to present the best opportunity for exploitation, and textile

fibers seemed to be the most fruitful goal.

Heading up the research—now general manager at Taftville—was W. P. terHorst, who had learned a great deal about polymers in general and fibers in particular at U. S. Rubber Co. and Industrial Rayon Corp. But it was no easy task, in spite of that experience, to unravel the protein knot. Proteins are reactive, and that's a help, but recorded knowledge in the scientific literature was comparatively meager.

Attention was directed to film-forming proteins, for if they form films, they will also yield fibers. Early evaluations were crude: a chemist would plunge his fist into a pot, remove it, spread his fingers; if they were webbed, he was on the right track. Once terHorst sat down and listed all the variables he knew of. There were over 4,000!

Dissolve, Coagulate, and Cure

By last summer a fiber process was developed which was capable of turning out a uniform product day after day. A pilot plant at Carteret, N. J., turned out several thousand pounds and the Taftville plant will operate along the lines indicated by the smaller-scale operation.

The raw material is commercial vegetable protein, obtainable from soy beans, peanuts, wheat gluten, cottonseed, or corn (zein). It is dissolved in caustic and extruded through spinnerets into an acid coagulating bath. The fibers are then stretched, "cured," washed, and cut to staple length. Either before or after cutting they are crimped—either mechanically or chemically. All fiber is staple now, but continuous filament fiber is in the works.

The "curing" step is Virginia-Carolina's pearl of great price. It is akin to the vulcanization of rubber, and here terHorst turned his knowledge of rubber chemistry to account. Too much cure, like over-vulcanization, gives a hard, cross-linked product; too little leaves it weak and tacky.

Neither Fish Nor Fowl

Vicara is not "like wool." Neither is it like rayon, or linen, or cotton, or nylon. But it is more like wool, possibly, than like any of the others. It has high modulus and elastic recovery; it is inherently shrinkproof (specified less than 5%, actually 1%-2%) and mothproof; and it dyes readily at the boil with acid and chrome dyes. It can be bleached and laundered. By modifying the manufacturing process the fibers can be made moisture-repellent or moisture-absorbent, depending on the ultimate use. It is resistant to abrasion, adequately strong, and warm to the touch. More important, it is not "itchy."

The new fiber processes well on regular textile equipment to produce 100% Vicara yarns, knitted or woven fabrics, or blends with other fibers. In the latter its resiliency imparts a desirable "hand" and drape.

Relating physical properties to chemical constitution is an occupation which intrigues terHorst. The inherent mothproofness, for example: No one knows why moths don't attack Vicara, but he guesses that moths like cystine, don't like arginine. Wool is high in the former amino acid and low in the latter, but Vicara is the opposite. The resilience he explains by the fact that half the molecular weight of the fiber (which runs about 40,000) is in the side chains. Thus the chains cannot approach each other as closely as those of nylon or cotton, cannot be held rigidly by valence forces.

Sizable Markets Foreseen

Already experimental lots are being investigated by fiber users, and some applications hold promise of affording large markets.

Some rabbit fur for hats, for example, has risen in price from \$2.50 to \$11 a pound. Vicara, at \$1 a pound, can be substituted up to 25% with no sacrifice

W. P. terHORST: He listed four thousand.

in quality. Men's suits, socks, and sport shirts are also promising applications, as are women's dresses, blankets, underwear, and upholstery. Second to steel in the cost of an automobile is the average \$26 spent for upholstery; Virginia-Carolina believe that Vicara can trim costs.

National Dairy sold the Aralac plant because it had more profitable uses for its own casein, and imported casein is in many ways a gamble. The plant was capable of turning out 10,000,000 lb. of Aralac a year, but Virginia-Carolina hopes to multiply that capacity by a substantial factors.

The Taftville plant will be the first of its kind. Three European plants turn out protein fibers, but they are based on casein. A peanut protein fiber (Ardil) plant is going up in England, and a pilot plant, based on soybean protein, is in operation in this country. Competition is coming, but Virginia-Carolina hopes to keep its head start in what is potentially a thumping big business.

FIRE-FIGHTING PAINT

Albi-R, a war-developed resin-base phosphate paint, is making fire-retardant history.

AN EFFECTIVE fire-resistant coating that could simply be brushed or sprayed on wooden surfaces had been a fond hope of researchers for many years. Several such compounds had been made and had met with varying degrees of success, but it was left for a war-developed material called Albi-R to fulfill for the first time what the National Board of Fire Underwriters regarded as minimum requirements for a true fire-retardant paint.

That was almost three years ago. Today Albi-R is going something like a house afire itself—a house not painted with Albi-R, that is. Albi Manufacturing Co., which makes the paint, expects to produce enough this year in its expanded plant at Hartford, Conn., to cover at least 40,000,000 sq. ft., which is just about twice as much as it had made all told through 1947.

Getting rid of this additional amount does not appear to be a problem at the moment. In addition to government and municipal agencies, which until a few months ago took over 90% of its output, the company this year has organized a network of some 1,100 retail outlets throughout the United States and Canada. Hotels are expected to consume a major portion of the 1948 output, and if tests being conducted by CAA and the major transport plane manufacturers are as successful as anticipated there should be a sizable market in the aircraft industry by the end of the year.

Resin-Phosphate Combination

Not to be confused with fire-retardant impregnating materials for wood and other combustible fibrous materials, Albi-R is a strictly surface preparation. It is applied over wood, fiber board or wallpaper in exactly the same way as paint. Compositionwise it is a water dispersion of a resin-ammonium phosphate combination. When a coating of the material on a surface is subjected to flame or intense heat it puffs up into a tough, adherent, cellular blanket ¼ to ½ inch thick.

This blanket of blistered, charred resin is of course the key to Albi-R's fire-protective properties. The cellular structure serves not only to insulate the surface and prevent spreading of the flame, but during its formation it gives off ammonia gas through the decomposition of the ammonium phosphates which tends to dilute the combustible gases and prevent access of oxygen.

So impressed was the fire-conscious American Hotel Association with Albi-R's stellar performance in a series of tests conducted for it by the York Research Corp. last year that it rushed

ALBI-R puffs up like this when subjected to heat, forms a tough insulating blanket.

IGNACE ALEMBIK: From the London Blitz, a life-saving idea.

to all members a special report which gave the material a sweeping endorsement as "the outstanding (fire retardant) coating currently available." Albi-R also boasts other seals of approval that read like a blue book of the worlds leading testing agencies.

Inspired by the Blitz

Albi-R was the idea of Albi's president, Ignace Alembik. Hitler's panzers had reduced Alembik's chemical and pharmaceutical business in France and Holland to a shambles in 1940, and most of his personal fortune was gone by the time he stepped off the boat in New York. He did have with him the results of some work his company had been doing on a new fungicide, however, and it was his hope to establish himself here and make the fungicide for the U. S. Government.

But it was about this time that the Germans began raining fire bombs on London, and Alembik decided to go to work on a fire-retardant paint instead. Technically trained himself, he took his ideas to Dr. Grinnell Jones and Dr. Walter Juda of Harvard University, who set up a research project on the subject.

RESULT when a stairway, the right half of which was painted with Albi-R, was set afire.

Albi Chemical Co., Inc., was organized to finance the work, and the patents now pending on Albi-R will be assigned to it when they are granted. Albi Manufacturing Co., Inc., was set up later to manufacture the material.

Take Two Powders

The paint is packaged and sold in the form of two separate white powders, one of which serves as a hardening agent. The two powders are mixed with water just prior to use, and the paint is then applied by brush or spray. A hard, smooth coating is obtained, whose durability and other properties are claimed to be comparable to those of ordinary cold water paints. Tints are obtained by adding dry pigments (except sulfides) up to 5% by weight.

Like other water paints, Albi-R does not stand up well under exposure to high moisture, and so is recommended for interior use only. Where high moisture conditions are present, however, it may be covered over with ordinary oil paints. Effective coverage with Albi-R is obtained with 125 to 200 sq. ft. per gallon. The retail price of $5.95 per gallon is about twice that of ordinary interior water paints and somewhat more than most oil paints.

Results of the Underwriters' Laboratories tests showed that wood painted with Albi-R retards the spread of flame by 60 to 70% compared with untreated wood, and its "fuel contribution" is only 10 to 15% that of untreated wood. This latter rating indicates the extent to which a material contributes fuel to an attacking fire and is determined by the temperature developed during exposure to the fire. It is interesting that of two chemical impregnation methods listed by Underwriter's Laboratories, neither reduces the fuel contribution factor as far as Albi-R.

Of very recent interest is the use of the paint on metal surfaces to prevent the transmission of heat to flammable materials on the other side. Survivors of the Constellation airliner crash at Boston this winter, some of whom jumped 15 feet from emergency exits to the ground to escape the flames, reported that fire penetrated the fuselage in less than a minute from the time it was discovered outside. Some preliminary tests with Albi-R on an 0.032-in. thick sheet of aluminum were conducted recently in which a 2,500°F. blowtorch flame was played against the painted side. After 20 minutes of continuous application of the torch, the temperature of the metal on the other side had reached only 300°F., which is well below the ignition point of most flammable materials.

These tests are now being confirmed by the Civil Aeronautics Administration's test station at Indianapolis and by the major transport plane makers. If they are successful, they will mean several million additional square feet added to Albi-R's backlog.

AQUA REGIA VAPOR

Nitrosyl chloride is a phenomenon as rare nowadays as a two-headed calf: a new inorganic "heavy" chemical.

"WE NEED a process that can produce chlorine without forming sodium hydroxide," said officials, back in the early '30s, of the Solvay Process Co. (now Solvay Division of Allied Chemical & Dye Corp.). Development men went to work, and the result was a process which not only produced chlorine but also nitrosyl chloride, NOCl.

When the first chlorine unit at Hopewell, Va., was completed, in 1936, nitrosyl chloride was recycled for recovery of the nitrogen values. A second unit was completed early in 1942, and today much of the nitrosyl chloride recovered for sale or other use.

Nitrosyl chloride is the reddish brown gas that is the active ingredient in aqua regia. As would be suspected, this material is extremely corrosive. Only tantalum is resistant to the moist material. However, the dry gas does not attack nickel, Inconel, tantalum, lead, or platinum at ordinary temperatures. In the field of non-metals, Pyrex glass, polyvinyl chloride, and saran are suitable materials of construction.

Nitrosyl chloride is a versatile low-cost reactant. It is used for the production of Solvay's Nytron synthetic detergent—for which planned capacity is well over 15,000,000 lbs. per year. It has also shown promise as a replacement for nitrogen trichloride in wheat flour "bleaching." Flour millers are almost frantically searching for such a replacement: Evidence has been uncovered that the product of that bleaching method is dangerous when the flour is used for human consumption. Nitrosyl chloride shows considerable promise for some uses

as a diazotizing agent, replacing sodium nitrite. It can be used for the preparation of dyestuffs, but it appears that it will be first used in the synthesis of certain pharmaceuticals. Its use will permit control of the position of substantive groups in the synthesis of certain drugs. Here it will not have to overcome the competition of existing units.

The recent ⓄK of the Interstate Commerce Commission on the use of nickel-lined steel tank cars as well as the earlier approval of nickel cylinders has made nitrosyl chloride readily available anywhere in practically any desired volume.

Chlorine Upsets the Applecart

Since the introduction of the electrolytic process for the production of caustic soda, the economic balance between the amount of chlorine and caustic produced has been delicate. Initially, chlorine was a "by-product," to be disposed of in the cheapest manner possible. By the early '30's, demand for chlorine had reached the point where caustic was in jeopardy of relegation to the "by-product" class. Thus a means was required of producing chlorine without concomitant caustic. The result was Solvay's "salt process," which yields both Cl_2 and NOCl.

Salt is reacted with concentrated nitric acid in a tower. The products are a concentrated solution of sodium nitrate, which passes off at the bottom of the tower, and a mixture of chlorine, nitrogen tetroxide, and nitrosyl chloride at the top. The gaseous mixture is then passed into another tower where the chlorine passes over at the top and nitrosyl chloride, containing anywhere from 4 to 10 per cent nitrogen tetroxide, is removed at the bottom. Most of the nitrosyl chloride now produced is passed into soda ash for recovery of the nitrogen values as sodium nitrite.

Solvay's new synthetic detergent plant at Hopewell, Va., brings an entirely new type of detergent on the market. A long-chain olefin fraction from petroleum adds nitrosyl chloride to form the nitroso chloride. The product of this reaction reacts with sodium bisulfite to form the detergent. It is a free-flowing, light-brown powder which is scheduled to sell in the same price range as the alkyl aryl sulfonate type. It is a good ion-sequestering agent as well as a detergent. According to a company official, laboratory tests indicate that as a general purpose synthetic detergent, Nytron is equal to, or better than, any other type.

Outlook

Nitrosyl chloride is the first new heavy chemical to go into large-scale production in many a moon. Its great reactivity, low cost, and the ready availability of the necessary raw materials promise a rapid expansion in its use. It will take its place alongside such old hands as chlorine, sulfuric acid, and nitric acid.

BOB AND TRANSIT

Gas adsorption is a tool of growing importance for plotting the infinitesimal topography of particle surfaces.

SINCE many of the properties of substances are actually dependent upon the characteristics of their surfaces, and since many reactions take place, not en masse, but at interfaces—what better approach than to study the surfaces themselves?

That's the philosophy that led Lehigh University to set up a Gas Adsorption Laboratory about five years ago, to use the technique of gas adsorption to delve into the nature of chemical surfaces. The laboratory, under the direction of Associate Professor A. C. Zettlemoyer, has already looked into such diverse problems as these: Why is an iron oxide pigment richer-looking when it is prepared in the presence of certain impurities? Why do some manganese dioxide ores make better dry-cell batteries than others?

A Gas Envelope

Extensive series of experiments have proved that gases are adsorbed on surfaces in a close-packed layer. Knowing the temperature, the pressure, and the amount of gas involved, the experimenter can determine what proportion of the gas is adsorbed; and knowing the density of the condensed gas, he can calculate the area occupied by each molecule and thus the area of surface covered by the total number of adsorbed molecules.

First—and although it sounds simple the technique is quite complicated—he measures the amount of adsorption at various pressures, keeping the temperature constant. The plot of these values against pressure, called an adsorption isotherm, yields significant information on the area, the heat of adsorption, and nature of the adsorption—whether the surface has "active centers" which adsorb more strongly than the remainder of the surface.

Further than this, by using smaller and larger molecules and noting the variation of area covered, he is able to determine the pore size of the surface. And finally he can measure the volume of gas adsorbed at different temperatures and combine this data with isotherm data to calculate the heat of adsorption—a characteristic proportional to the activity of the surface.

Case of the Impure Oxide

Using such experiments, Zettlemoyer has "cracked" mysteries of more than academic interest. The monohydrate of iron oxide, for example, is a commercial yellow pigment prepared by a corrosion process. When it is made in the presence of certain impurities, a richer-looking product is obtained than when these impurities are not present. This new pigment forms a transparent coating when dispersed in linseed oil, and the usual physical tests, such as X-ray examination, failed to distinguish the new variety from the old. But gas adsorption showed up the difference, proved that the surface area of the new type was ten times that of the older, its pore size only half.

Case of the Active Ore

Similar techniques proved to be of value in predicting the worth of manganese dioxide (pyrolusite) ore for manufacturing dry cells. Activity of the oxide was shown to depend on surface area per unit weight.

A great deal of work has also been done at the laboratory, under the auspices of Westvaco Chlorine Products Corp., on Active Magnesia. This material was used in the synthetic rubber program as a dehydrogenation catalyst in the conversion of ethylbenzene to styrene. Commercial active magnesias have been shown to have surface areas ranging from less than one to over 200 square meters per gram.

The problem of magnesia activity is of primary concern, for the material is now being used as an adsorbent in removing silica from boiler water; fatty acids from petroleum fractions; and impurities from petroleum lubricants, dry cleaning solvents, and other nonaqueous, unreactive fluids. It is also used in chromatography and shows promise as a solid basic catalyst for vapor-phase organic reactions.

Engineering and Biology

Growing industrial interest in chromatography and other methods of adsorption separation (CI, October, 1947, p. 625; February, 1948, p. 224) gives added luster to Zettlemoyer's studies. Heats of adsorption as measured by these techniques, for example, enable researchers to predict efficiency of separation. Long-term projects are also under way at Lehigh to learn the role of adsorption in leather tanning and the printability of printing inks. Wherever a fluid is in contact with a solid surface, as when a pigment is dis-

A. C. ZETTLEMOYER: A gaseous yardstick to map surfaces.

persed in a vehicle, adsorption exercises a profound, but little understood, influence.

Of major interest at the laboratory right now is adsorption on organic surfaces. The work of Pauling on the structure of proteins has indicated that surface structure is the controlling factor in deciding the specific activity of a protein. Also, it is now held by some that the action of antibiotics depends on adsorption phenomena at cell walls.

Some work on proteins has already been done at the laboratory, but it now appears that these fundamental studies must be started from the bottom up. Does a protein adsorb along its hydrocarbon portion, for example, or only at the polar centers?

To answer such questions, Zettlemoyer is starting out with something simple: ordinary hydrocarbons, such as polyethylene. From there he will travel along unexplored paths, leading, very possibly, to invaluable new knowledge about surface phenomena.

PLANETARY CHEMICALS

Specializing in chemicals for greenhouses and orchards, a new Missouri chemical company is building a booming business.

GREENHOUSE growers occupy a niche in agriculture similar to that of skilled artisans in manufacturing industry; their business is more intricate than big, requires special knowledge and tools.

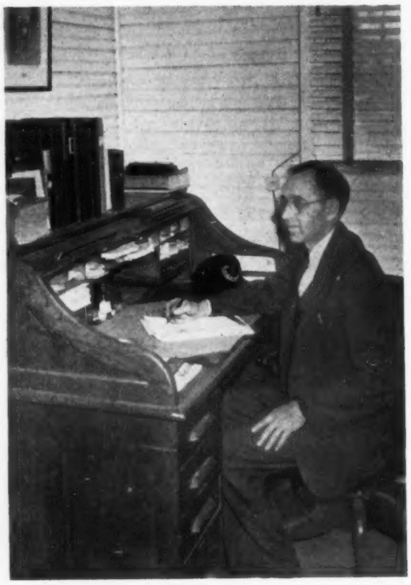
To service the specialized chemical needs of the greenhouse trade was the idea behind the formation, in 1946, of Planetary Chemical Co. of Creve Coeur, Mo. The plan worked so successfully that the company is now extending its specailized service technique into the fruit-growing field, has acquired experimental orchards, and is adding to its manufacturing facilities to permit production of a wider variety of insecticides, dispersants, wetter-spreaders, spreader-stickers, liquid fertilizers, fungicides, and similar greenhouse-orchard chemicals.

Even wider horizons are indicated by a current foray into the wood preservation field. The company has just completed developmental work on an odorless wood preservative of the pentachlorphenol type for interior use.

Faith and An Idea

Planetary originated in the minds of two young St. Louis chemists, Ira Hatfield and A. H. Winheim. Hatfield left a good job in the technical service department of Monsanto's Organic Chemicals Division to back up his faith in the idea that the market for chemicals in greenhouses could be increased appreciably if a real service organization were set up and a line of products developed that were tailored specifically for greenhouse needs. Winheim resigned from his position as chief chemist of the International Shoe Corp. to aid in the project, and later S. R. Feldman, formerly of Western Cartridge Co., joined the team as chief chemist.

The original aim was to build a related series of greenhouse chemicals of such formulations and strengths that they could be used with a minimum of fuss either singly or in combination. This series now includes a group of products known as D-Spers-O's (non-sulfonated emulsifying and surface-active agents), Cert-O-Kill (water-miscible DDT concentrate), Blot (70 per cent hexaethyl tetraphosphate in water-miscible form), Planeto (water-miscible high-concentration chlordane), and several other materials having phytotoxicity.



IRA HATFIELD: Greenhouses nurtured the idea.

Lately the company has added liquid fertilizers for sub-irrigational work in greenhouses, fungicides (zinc-8-hydroxyquinolinolate, with others under investigation), and aerosol bombs (hexaethyl tetraphosphate with a methyl chloride propellant). Chlordane formulations have been expanded to include oil solutions, dusts, and blends with other insecticides, and a new non-ionic surface active agent of the aliphatic amine condensation product type has been developed particularly for use as a dispersant for waxes. On the docket for the near future are a group of fumigants (methyl bromide, methyl bromide-ethylene dichloride mixes, chlorpicrins).

Sales of its products in most areas have been turned over by Planetary to independent distributors, although the company itself is maintaining extensive contacts in the field and is providing the service facilities. The company considers these last as its best merchandising tool and is expanding its operations only as fast as service demands will permit.

EASTBOUND CHEMICALS

The Marshall Plan will not augment the flow of chemicals to Europe but will maintain it at present levels.

THERE SEEMS little doubt at this writing that some form of the Marshall Plan—scaled down to some extent, possibly, from the Secretary of State's recommendations—will pass both houses of Congress and become an established fact. Whether the Plan is advisable or not is a matter of personal opinion; but its effects, in so far as the American economy and American business are concerned, are susceptible in a considerable degree to factual analysis.

Its effect on the over-all economy will be, of course, inflationary. To this extent it will affect the chemical industry in much the same way as other industries.

Triple Effect

But it will touch the chemical industry directly in three ways: (1) It will delay, by three or four years, any appreciable easing of the steel shortage and thereby lessen the availability of equipment, machinery, and construction. The voluntary steel-dispute, won't help any. The State Derationing program undertaken by the steel companies themselves may yield, under necessity to meet commitments, to a compulsory rationing program similar to that under WPB. (2) It will help maintain high price levels for those agricultural and mineral products used as raw materials for chemical manufacture. And (3) it will maintain the present peak level of chemical exports, keeping the domestic supply and demand in taut balance.

Actually, the European Recovery Program (as the Marshall Plan is now officially called) will not increase the flow of chemicals to Western Europe, but it will maintain that flow at its present high levels. Without such a program, the flow will dwindle to a trickle, for European dollar balances are far too low to maintain more than a small fraction of present imports from this country.

The confidential commodity reports on the ERP, just recently declassified by the State Department, do not break down chemical commodities. But a pretty good idea of what the program will involve can be gained from an analysis of present exports to that area. The 16 countries involved have submitted an estimate of chemical needs amounting to $250 million for the coming year (July, 1948-June, 1949). The aggregate, through June, 1952, is $850 million. The $250 million includes industrial chemicals, $50 million; paints and pigments, $40 million; coal tar chemicals, pharmaceuticals, and unspecified chemicals, $160 million.

That $250-million figure, however, jibes pretty closely with 1947 exports to those countries; and in the absence of more detailed information from abroad, the expectation is that American aid ship-

ments will be generally tied to the figures of actual shipments to the various countries in the past year.

Around the Mulberry Bush

European purchases are a minor part of our chemical exports, most of which go to Canada and Latin America. (Total chemical exports last year ran to $750 million.) But the ERP will affect those purchases in a roundabout, but perfectly logical, way. Dollars from the U. S. will enable European countries to buy commodities from other Western Hemisphere nations, allowing them in turn to maintain their purchases here. Whether that is good or bad depends on whether one is an exporter or a domestic buyer looking for a reasonable price!

The following table, compiled from the findings of the Krug Committee, shows how the situation stands in regard to supplies of individual commodities. Those on the left are short and likely to remain so for the balance of this year—and in some cases longer; those on the right are in fairly good supply, and European needs are not too likely to upset the apple-cart:

Short	*Available*
Soda ash	Carbon black
Caustic soda	Benzene
Phenol	Glycerine
Naphthalene	Methanol
Creosote oil	Formaldehyde
Cresylic acid	Carbon bisulfide
Dyes	Sodium bichromate
Medicinals	Sodium phosphate
Nicotine insecticides	Carbon tetrachloride
Arsenical insecticides	Sodium silicate
Sodium sulfate	Sodium bicarbonate
Chlorine	Sodium chlorate
Caustic potash	Acetone
	Ethyl alcohol

Pinning Down the Air

None of the above figures includes fertilizer chemicals. Europe wants 70,000 metric tons of nitrogen fertilizer (worth $14 million), but there's no chance of fulfillment: There's a world nitrogen shortage of 900,000 tons a year. Expansion of capacity in this country will relieve the pressure on South American nitrate, and rebuilding of nitrogen-fixing facilities in Europe will bring supply and demand into balance by 1951-52. In the meantime American farmers will have to get along on the same amount they have been getting in recent years. This has raised quite a furor in farm circles, and pressure exerted by those groups may lead to some form of control over nitrogen fertilizer materials.

Also close to, and influencing, the chemicals program is Europe's need for petroleum. It is doubtful whether that need can be met, and Arab animosity towards the U. S., engendered by the Palestine dispute won't help any. The State Department was counting heavily on Middle East oil to bolster the European economy; and that economy may stand or fall depending on whether enough petroleum—from whatever source—is forthcoming.

During the next four years, then, provided the ERP is approved, the chemical industry will likely be faced with a continuation of high—or higher—prices; reimposition, possibly, of some Government controls; more red tape in transacting export business; and—the brightest spot in the picture—continued high-level output.

CHEMICALS FOR EUROPE: If credit is not extended, barren will be the quay.

ROLLING WAREHOUSE

An ammonia refrigeration system for railroad cars enables controlled-temperature shipping.

FROZEN food and other perishable commodities will soon be traveling from the state of Washington to Eastern markets in thermostatically-controlled refrigerator cars in which the temperature varies only a few degrees from the optimum 0° F. Food processors, railroads, the U. S. Department of Agriculture, and ammonia makers all have a watchful eye on trial shipments now under way.

Ammonia refrigeration isn't new, of course, but the application of its principles to rail transportation took a lot of doing. It started with inventor Oliver Irwin, who was granted patents covering the application of ammonia refrigeration to vehicles. The system described in his patents was operating in trucks several years ago.

CLAYTON IRWIN: Ammonia vaporizes, plans crystallize.

Then, through a series of financial deals, Irwin's patents became the property of Standard Cap & Seal Co. A totally-owned subsidiary, Frigid Transport Co., operates that phase of the business; and upon its president, Clayton Irwin (no kin to the inventor), has devolved the job of evangelizing the food packers, the railroads, and the Government's agricultural men on the merits of the new method of refrigeration.

Half in the Car, Half in the Yards

Briefly, the system works as follows: Aluminum tanks holding 3750 lbs. of liquefied anhydrous ammonia are carried under the car. The ammonia is allowed to evaporate and expand through a thermostatically-controlled valve into the finned cooling coils on the car ceiling. The expansion does the cooling, and the spent ammonia is absorbed in water. The rest of the cycle—driving ammonia out of water solution and recompressing it to a liquid—is carried out at service stations along the route. Here the ammonia-laden water is drained and replaced with fresh water, and the depleted ammonia tanks are replenished with liquefied gas. Then the ammonia in solution is recovered for the next car. Because half of the refrigeration cycle takes place in the car, the other half at a permanent station, the system is called "split-absorption."

No Muss, No Fuss

The new system has several advantages over present ice-and-salt practice: Only two intermediate servicings—one at Williston, N. D., one at Chicago—are required for a Washington-to-Jersey City run. This will cut at least a day off the 12-day schedule, for ice and salt bunkers have to

be replenished every day, and each servicing requires 2-3 hours. Temperature control is better, and shrinkage of food in transit is less. (Because ammonia coils aren't as cold as ice-and-salt bunker surfaces, less moisture is evaporated from food. In meat shipping, the saving is estimated at 3 per cent of a 30,000-lb. load, or 900 lbs.) There are no moving parts, except the valve, and no attention is required between servicings.

An 11-day test last Summer, conducted by the U. S. Department of Agriculture, proved that the car was able to maintain a temperature of 0° F. while the outside temperature was 92° F. A load of frozen tangerine segments was the "guinea pig," and the cooling system used 42 lbs. per hr. of ammonia to keep it at the optimum temperature during the course of the test.

Just as Cheap

Right now ammonia refrigeration is slightly more expensive, but Irwin believes that large-scale use will erase the difference. So far, only two experimental units have been completed, but Fruit Growers Express Co. is building six—and may build ten. These will be leased to shippers (Birdseye-Snyder Division of General Foods Corp. will take six) and Fruit Growers Express will also maintain service stations at Williston and Chicago.

There are now 150,000 refrigerator cars in service in this country. Irwin believes that the immediate potential for ammonia cars is 15,000; further replacement is a long-term proposition and will require establishment of service stations at all important railroad centers. But even 15,000 cars represents upwards of $50 million in refrigeration equipment (to be amortized in 20 years), additional investment in ammonia reclamation equipment, and an initial 30,000 tons of ammonia. No wonder, then, that the development is being followed with more than usual interest.

FIRE METER

A new testing device allows closer flammability evaluation of polyvinyl chloride plasticizers.

INCREASING emphasis on legislation to limit the use of flammable plastic coatings and films has stimulated plastics makers to examine more carefully than ever the properties of their products with regard to fire hazards. While a number of standard test methods (ASTM D 568-43, D 673-44, D 757-44 T) have been in use for some years, they have been criticized for the somewhat inconclusive results which are obtained and the ease with which errors in estimation can be made.

In polyvinyl chloride plastics the chief offender, from the flammability standpoint, is the plasticizer; the chloride itself requires considerable heat to burn and the flame ceases when the source of heat is removed.

Resinous Products & Chemical Co., a producer of polyvinyl plasticizers, concerned itself with the problem, and Dean L. Owens, of the laboratory staff, devised a test which gives more closely correlated results than methods used hitherto.

Test Procedure

The test device consists essentially of a piece of 0.040" sheet iron which has been bent to a 30° angle. One plane of this angle has been extended by a section of 20-mesh Bunsen burner gauze. The other arm of the angle is used as a support and a heat deflector. By maintaining this arm of the angle in a vertical position, an inclined table with a 30° pitch is obtained. The source of heat is regular ⅜"-base Bunsen burner adjusted to give a 10" flame with a 1½" cone. This produces a deep red spot about 1" in diameter on the upper surface of the iron plate, the temperature of which is 1300° to 1310° F. A pilot light is situated 1" vertically above the junction of the iron plate with the wire gauze and is regulated to give a luminous flame approximately 1" long to ignite the vapors given off by the hot sample when they become copious enough to burn readily. The whole apparatus is enclosed in a three-walled chimney 12" on a side and 30" tall to prevent drafts. The tests are run in a laboratory hood but without the fan in operation to control further the draft conditions.

The sample used in this test is a free film cut to 5½" x 1" x 0.010". The plasticizer concentration in these films is standardized at 35 per cent by weight. No stabilizers or lubricants are used.

The test procedure is to place ½" of the film in the spring clamp at the end of the wire gauze. The sample is allowed to fall down the incline of the apparatus and a stop watch is started the moment the end of the film makes contact with the hot surface of the plate. The moment a continuous flame starts, the stop watch is stopped and a second stop watch is started. The time shown on the first stop watch is recorded to the nearest 0.2 second as ignition time. When the flame of the sample goes out, the second stop watch is stopped and the burning time is recorded to the nearest second.

Per cent flame travel is recorded as the per cent of the exposed 5" film consumed by flame or charred. The rating is recorded to the nearest 5 per cent. Rate of burning is per cent flame travel divided by burning time.

An Equation for the Data

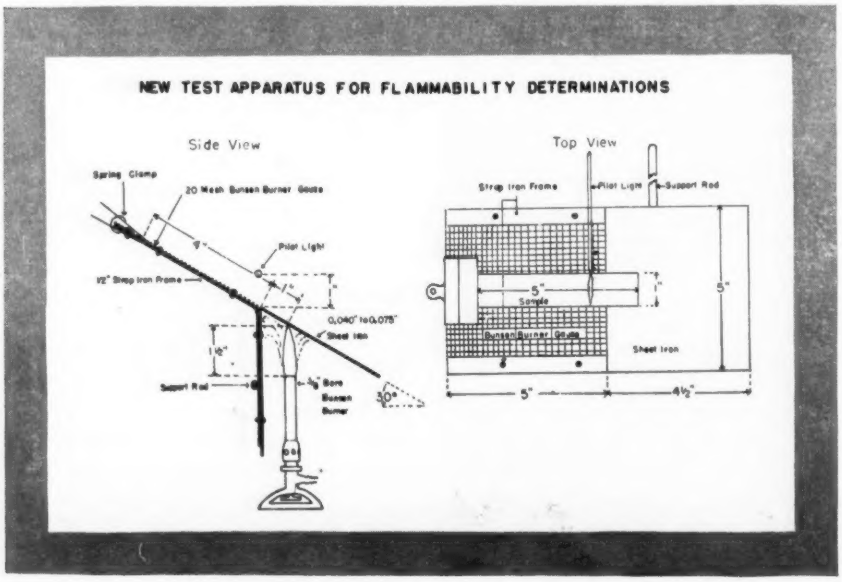
No research chemist is happy, of course, unless he has an equation to fit his figures into. Owens has one: The flammability rating is equal to ten times the rate of burning minus the ignition time plus the per cent flame travel minus 30, or

$$F = Rb \times 10 - Ig + \%ft - 30.$$

Subtraction of 30 is necessary to obtain a common base for comparison since a tricresyl phosphate-plasticized compound—considered the ultimate in flame resistance—will char reproducibly to the extent of 30 per cent under test conditions. Its flammability rating is arbitrarily taken as O. Trioctyl phosphate, it turns out, has a rating of 41 and dioctyl phthalate, 87.

Once a few standard plasticizers are approved or disapproved on the basis of tests specified in various fire laws, other plasticizers could be immediately and accurately classified by this test.

While flammability is an important factor in judging the qualities of a vinyl compound, it is by no means the sole criterion and a balance must be struck between such properties as permanence, ultra-violet resistance, resistance to oils



TEST SET-UP. A ruler, a flame, two stopwatches.

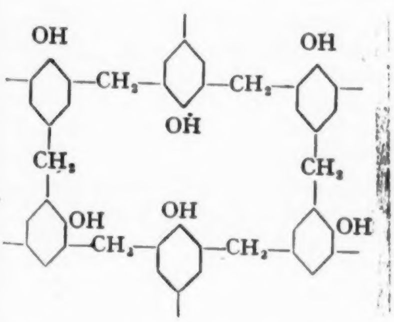
DEAN L. OWENS: An equation foretells the danger.

and solvent extraction, etc. However, there are so many differences of opinion and so many variables in test methods on flammability, that Resinous Products hopes the field will investigate this new test to determine its general applicability to the problem of vinyl compounding.

ANGLE ON RESINS

A consideration of the bond angles in phenol-formaldehyde resins explains some of their physical properties.

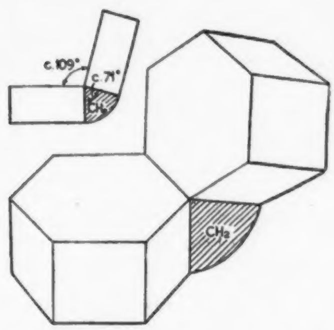
EVEN a well-trained organic chemist—unless he has been exposed to a great deal of talk about molecular models, bond angles, free rotation, and other such theoretical concepts—will look at this formula for a phenol-formaldehyde resin



and pronounce it correct. How specious such a representation can be was pointed out to the Plastics Group of Britain's Society of Chemical Industry by N. I. L. Megson in his recent Chairman's Address.

Consideration of the structure in terms of generally accepted atomic radii and tetrahedral valence angles of carbon atoms leads to the inescapable conclusion that a diphenylmethane structure cannot be in one plane. Once this premise is accepted, the logical sequence of reason leads to some unexpected and even startling ideas about the properties of phenolic resins.

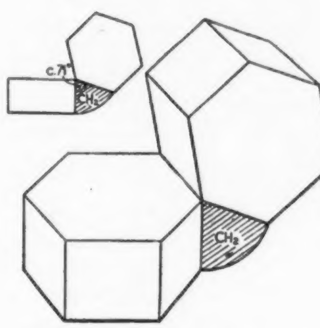
It turns out that the most likely configuration for a diphenylmethane is a bracket-like structure in which the planes of the two benzene rings are at an angle of 109°:



The rings can rotate around the methylene "universal joint" between them, but they can never be in the same plane.

Brittle Methyl Groups

But if the rings are substituted in the positions nearest the methylene link, rotation is hindered and the molecule must assume a rigid form:



Here the planes of the two rings are at right angles to one another.

The same arguments can be applied when several rings are joined in a chain, and such molecules must be in the form of very irregular, kinked chains having no symmetry.

What is the practical meaning of this? Simply that the properties of a resin can be better interpreted in the light of this hypothesis. A resin made from 3,5-xylenol should be more brittle, according to the theory, than one made from *m*-cresol; and the latter should be more brittle, in turn, than a phenol resin. The resins actually show that order of brittleness, and it can be logically explained as a function of the amount of "give" in the molecule.

Larger aldehydes than formaldehydes, such as furfural and acetaldehyde, should hinder rotation and give more rigid resins. It turns out in practice that the tensile strengths of phenol-furfural resins are commonly less than those of phenol-formaldehyde compositions.

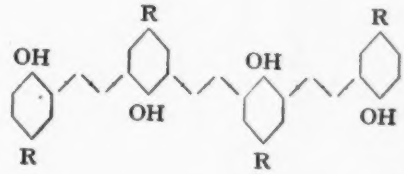
More Holes Than Expected

If the phenolic chains are highly kinked, it is extremely unlikely that more than a few of their active centers will be at the proper distance and angle for cross-linking. Also, if two distant rings are joined, the mobility of the intermediate rings will be reduced considerably, lessening even more the opportunities for joining. The conventional representation, on the other hand, would allow complete cross-linking.

Thus, a hardened resin will have a sponge-like structure, containing many voids. This structure can be invoked to explain such characteristics as low tensile strength, "tracking," and ion-adsorption.

With Two, They're Flat

If the phenyl groups are joined by a two-carbon bridge, however, as in diphenylethylene, a little consideration will show that the conventional-type representation



sentation is quite all right. The angles are equal and the methylene bonds are presumably equal in length. Thus the benzene rings can be in the same plane. A generalization can be made that when the number of intervening carbons is odd, molecular configuration is irregular, but when the number is even, the molecule can be symmetrical.

If this hypothesis is valid, the tackiness of the German plasticizer Koresin can be explained. That material has the above structure where R is the *tert.*-butyl group. Those groups are probably responsible for the tackiness, and it can be seen from the structural representation that they are readily available. Similar resins made from *p-tert.*-butylphenol and formaldehyde are less useful as tackifiers—an anomaly readily explained by the irregularity of the molecule.

Planar Structure Desirable

Megson pointed out that resins of the phenol-ethylene type may well be worth looking into as coating resins because of their flat, regular structure. Their electrical characteristics should also be of interest: Because the polar hydroxyl groups are in opposition to each other, dielectric losses should be decreased.

This and similar studies have done much to elucidate chemical structure, but more could still be accomplished.

Extrapolations of thought of this sort certainly cannot replace actual experimentation, but they can help explain puzzling results and indicate fruitful lines of research. If nothing else, such bedrock thinking can rectify the erroneous judgments based on the chemists' too-facile formulas, scribbled without meditation on two-dimensional paper.

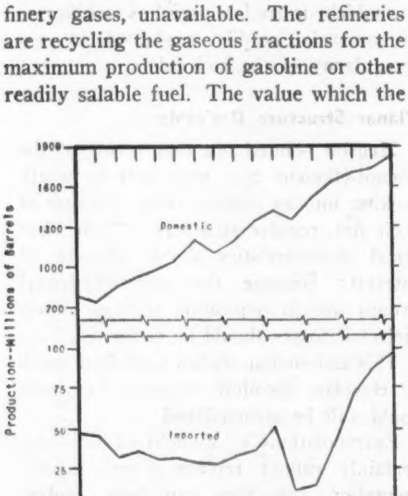
WHAT'S AHEAD FOR PETROCHEMICALS?

by HERMAN W. ZABEL, Engineering Editor
Chemical Industries, New York, N. Y.

THE PETROCHEMICAL INDUSTRY is in a state of flux. Raw material costs have doubled in two years, and large supplies are no longer available. In addition to the changes induced by these forces the present industry has the promise of strong competition from sale of the oxygenated fractions produced by the American version of the Fischer-Tropsch process.

THE recent upsurge in prices for all petroleum products—the price of crude oil in East Texas has advanced from $1.21 per barrel at the well to $2.65 per barrel during the last two years—forces a re-examination of the cost of raw materials for the production of aliphatic chemicals. In the case of butane and propane, long the favorite petrochemical raw materials, the price has already advanced to the point where their value as domestic fuels exceeds their value as raw materials for the production of aliphatic chemicals. The reason for this is readily apparent from the graph of the consumption of low pressure gas, LPG, over a period of years. Pricewise, there are reports that some liquid butane has sold for as high as ten cents per gallon. Prewar prices were under four cents per gallon.

The desire of the petroleum companies to produce a maximum of hydrocarbon fuels from the existing crude supply is also making the other favorite raw material source of the chemical industry, refinery gases, unavailable. The refineries are recycling the gaseous fractions for the maximum production of gasoline or other readily salable fuel. The value which the petroleum companies attach to these fractions is indicated by the fact that many refineries have ceased burning them under their boilers. Coal is now being used.



Imports of petroleum and petroleum products must fill the gap between demand and production until synthetic fuel is available.

An illustration of the effect that this situation has had on production costs is furnished by data on two products of a major petrochemical producer. It is realized that these figures are distorted by the general price increase but, according to the producer, most of the increase is due to the increased price of the major raw material, petroleum.

Product A, recovered as a by-product, has been produced and sold for 5.5 cents per pound for some years. Prewar estimates for a large plant producing this material as a primary product indicated the same selling price, 5.5 cents per pound. Today's estimates for a large unit show a required selling price of 8.0 cents per pound.

The present estimated selling price for product B now required for a commercial unit is higher than the indicated selling price from the pilot plant two years ago, if it had been operated as a commercial unit.

C_1 AND C_2 NEXT

About the only cheap hydrocarbon source which is left to the chemical producer is natural gas. Even here a low price is available for low-sulfur 1,000 Btu gas only when the location of the gas field is such that the gas cannot be readily sold for fuel. However, all natural gas is rapidly advancing in price because of the rapid expansion of pipelines into areas which previously were untapped. Hope for a further advance into now-untapped areas makes gas producers unwilling to enter into the long-term contracts required by chemical producers to justify the investment of the millions of dollars required for the erection of a petrochemical unit.

The present cost of petroleum hydrocarbons, in itself, will not serve so much as a deterrent to further expansion of the petrochemical industry as the inability to obtain a guarantee of a continuing raw material supply at a reasonable price over a period of years. In spite of this it is quite probable that there will be some further expansion of the petrochemical industry. This expansion, however, will take an entirely different form than in the past. That is, it will be based on the use of dry gas, containing only C_1 and C_2 hydrocarbons, rather than on butane and propane. A good example of this type of expansion is the new plant of the McCarthy Chemical Co. at Winnie, Texas (CI, Feb. 1948, p. 220) for the production of acetaldehyde and formaldehyde by the direct oxidation of dry gas.

It is improbable that many petrochemical plants will be built in the next few years solely for the production of the chemicals. Most of the new petrochemical capacity will come as a by-product of the production of synthetic liquid fuels from natural gas. Two plants for this purpose are now under construction in the United States. These two plants alone will be able to produce almost a third (50,000,000 gals.) of the ethanol used in this country in normal times.

In addition to the control exerted by the necessary disposal of the oxygenated products, the synthetic plants will exert a control on the prices of synthetic aliphatic chemicals by their control, with the aid of increased imports of crude, of the price of C_3 and C_4 hydrocarbon raw materials. This type of control will not be pronounced for some time, however, because of the long term contracts that most of the existing chemical plants are operating under and the improbability of erecting more units requiring the C_3 and C_4 fractions as raw materials. Most certainly any contracts negotiated at the present time will be at a much higher price level than those negotiated in the past.

LIQUID FUEL SOURCES

The method of supplying our liquid fuels during the coming years will have such a profound effect on the raw material supply for the chemical industry that it would be well to examine all possible sources. The present fuel oil shortages have served to dramatize the situa-

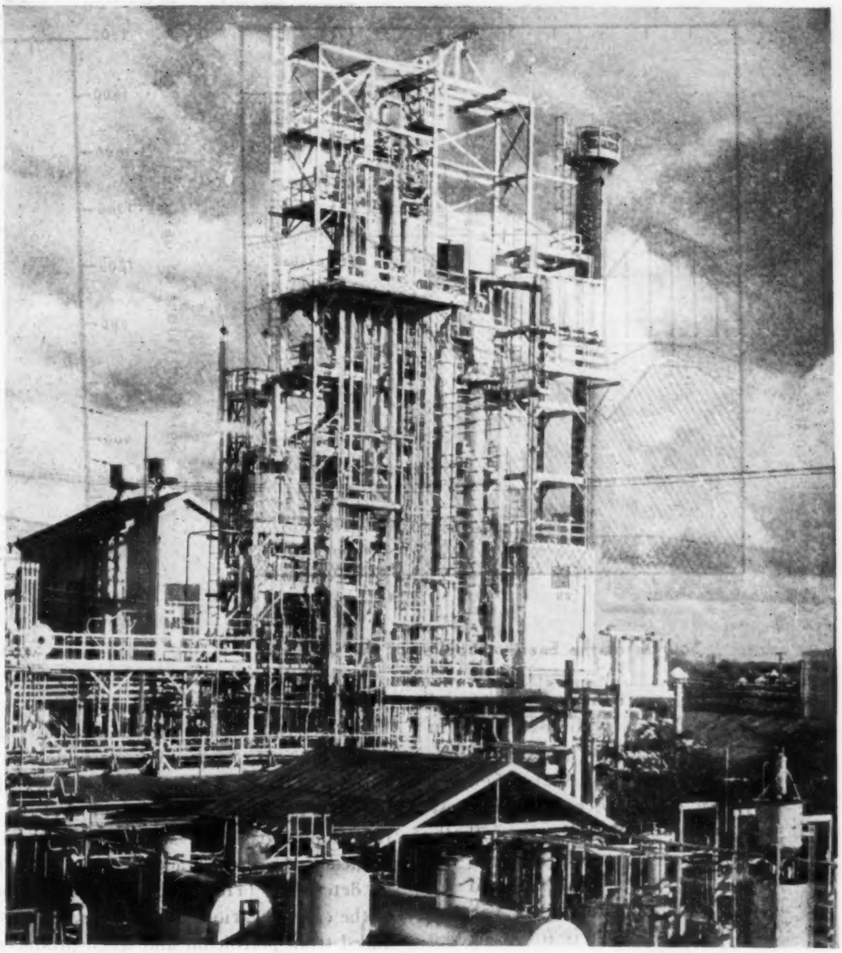
tion and to bring its realization to the general public.

The domestic requirements of crude petroleum are rapidly approaching the almost astronomical figure of six million barrels per day. The size of this figure can be appreciated when the recent well-advertised large discovery in West Texas by the Plymouth Oil Co. is stated in terms of days that it will supply the domestic consumption—about 100 days. Of further interest is the cost of the first well to tap this field, $750,000.

Six million barrels per day is well over the amount which can be produced in the United States without resort to imports, shale, or synthetic sources. For the first time this country has no shock absorber of non-producing fields, or fields producing only at partial capacity, to supply the increase in oil production required by any future conflict. Barring radical future technological changes, the method adopted for the solution of this problem will give a fair indication of the course of the organic chemical industry in years to come.

Basically there are four possible solutions to the liquid fuel problem. They are:

1. *Importation of crude oil from foreign sources,* such as the Middle East and the South Caribbean areas, in a quantity sufficient to close the gap between domestic production and domestic consumption. Substantial imports of foreign crude oil are underway at the present time and more can be expected. At best this is only a short-term measure. It will be stopped as soon as the foreign supplies run out or when the foreign areas decide that Uncle Sam has had his share. Because of the location of the known large foreign fields it is quite probable, in the event of any future conflict, that these will be unavailable to the United States. Because of this and the fact that domestic supplies must eventually be developed, a fairly rapid development of synthetic sources is a must. It might be said that importation of crude will serve as a stopgap until synthetic fuel plants can be installed.
2. *Production of synthetic fuel from a carbon monoxide-hydrogen mixture,* formed first from natural gas and later from coal. This might be termed the American version of the Fischer-Tropsch process. The importance that the major oil companies attach to this development is shown by the fact that The Texas Co. is now devoting more than one-fourth of its entire research program to the process, a figure which is probably representative for the larger petroleum companies. CO-hydrogen synthesis plants, to operate on natural gas, are being built by Carthage Hydrocol, Inc., at Brownsville, Texas, and the Stanolind Oil and Gas Co. at Hugoton, Kan. The Texas Co. is the largest stockholder in Hydrocol.
3. *Hydrogenation of coal* in a plant somewhat similar to the German plants which fueled the Luftwaffe. A demonstration plant, using a modern version of this process is being operated by the Synthetic Liquid Fuels Division of the Bureau of Mines at Louisiana, Mo. This plant obtains its hydrogen from a portion of the wartime synthetic ammonia plant which was operated by the Hercules Powder Co. during the last war. One major chemical company, not previously producing aromatic chemicals, is engaged in operating a large pilot plant for the "depolymerization of coal with hydrogen" (CI, July, 1947, p. 27).
4. *Retorting oil shales* which are found in huge deposits in Utah, Colorado and Wyoming. The Synthetic Liquid Fuels Division has recently completed a demonstration plant at Rifle, Colo. Also, pilot plant studies on shale are planned as a part of the activities of the recently constructed laboratories of the Standard Oil Co. of La. at Baton Rouge, La.



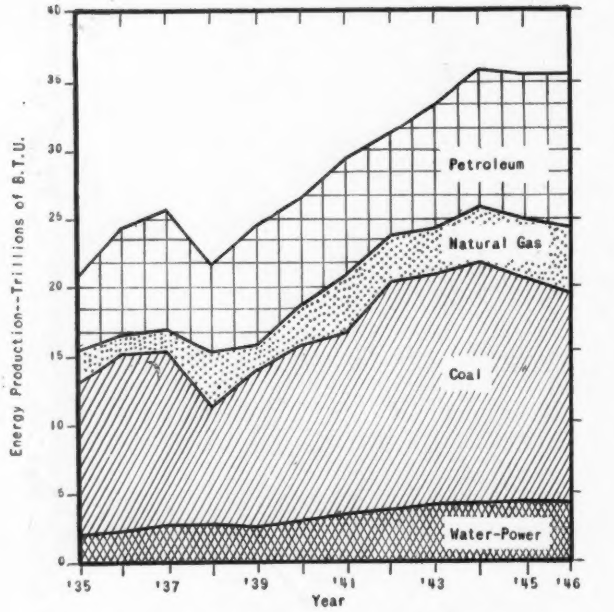
Harbinger of the future. Twelve-story pilot plant for the synthesis of liquid fuels from carbon-monoxide-hydrogen mixtures at the Baton Rouge laboratory of the Standard Oil Development Co.

NON-PETROLEUM SOURCES

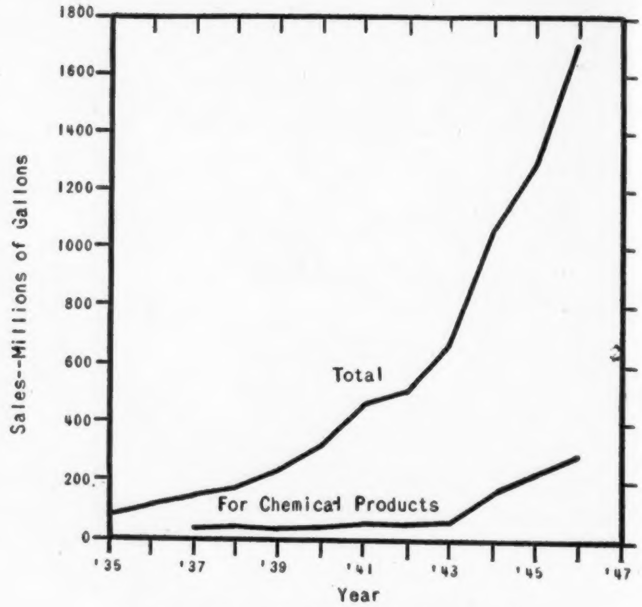
Study of the above four procedures and their various combinations provides a glimpse of the probable future of the organic chemical industry. However, as long as we have coal, and our experts disagree only in the hundreds of years that our reserves will last, there are two other important methods of preparing aliphatic chemicals. Also, a large number of materials can be prepared by fermentation and by the dry distillation of wood. Because of the dwindling supplies of wood and the high cost of processing, the latter procedure can be eliminated as a major source.

FERMENTATION

As late as 1945, fermentation processes provided 28 per cent of all of the aliphatic chemicals produced. This compares with a total of 85 per cent in 1925, the year of the birth of the petrochemical industry. It is well to note that the figures for 1945 are greatly distorted by the huge quantities of ethanol produced for the synthetic rubber program. (Chem. Eng. News, Vol. 44, pgs. 3208 and 3286, 1947). No ethanol is being used for this purpose today. However, the recent drastic price



Sources of the Energy Supplies of the U. S.



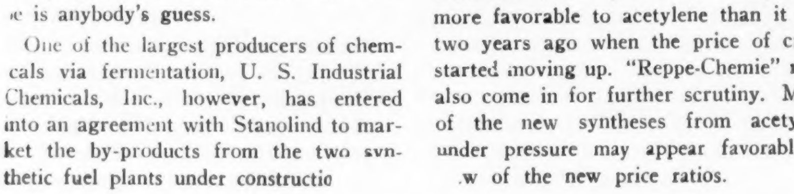
Sales of Liquefied Petroleum Gases (LPG).

reductions in carbohydrate materials should help the fermentation chemical industry. It may reach its prewar volume, even though it will not share the same proportion of the market. It is interesting to note, however, that even with the recent price reductions for grain, mo-asses, the preferred raw material for he fermentation industry, is as valuable is a livestock food as it is for fermentation purposes. What the final balance will e is anybody's guess.

One of the largest producers of chemcals via fermentation, U. S. Industrial Chemicals, Inc., however, has entered into an agreement with Stanolind to market the by-products from the two synthetic fuel plants under constructio

ACETYLENE

Comparison of the price curves for coal and crude petroleum gives a graphic picture of the change in the status of acetylene as a chemical raw material. Whether this change has been sufficient to greatly influence the use of acetylene is difficult to determine. However, the comparison of the cost of various chemicals when produced from petroleum and when produced from coal via acetylene is certainly much more favorable to acetylene than it was two years ago when the price of crude started moving up. "Reppe-Chemie" must also come in for further scrutiny. Many of the new syntheses from acetylene under pressure may appear favorable in .w of the new price ratios.



A 62% in the price of crude petroleum in four months versus a 10% increase for coal presages a greater dependence on coal as a raw material for production of organic chemicals.

The price of coal sets the price of acetylene in two ways. In many cases it is the determining factor in the cost of the electrical energy consumed in acetylene production, which is about five KWH per pound of acetylene in any of the electrical processes. It also sets the price of coke, one of the two raw materials. The oft-proposed production of acetylene from natural gas will continue to be only a dream unless much higher yields can be realized.

The first commercial production of aliphatic organic chemicals, other than via fermentation processes and wood distillation, utilized acetylene produced from calcium carbide. This was in Germany in 1916 at the plant of Dr. Alexander Wacker, Ges. fur Elektrochemische Industrie at Burghausen. The products included acetaldehyde and acetic acid. Improved versions of the original process are still in operation.

The first use of acetylene as a major chemical raw material in North America was at the plant of Canadian Electro Products Co. at Shawinigan Falls, Quebec, late in 1916. The plant was erected for the British Munitions Ministry for the production of acetone for cordite production. Late in 1917 the acetic acid requirements for the "dope" for airplane fabrics forced the process to stop when acetic acid had been reached. Operations ceased at the end of World War I and were started again late in 1919. This plant has since been expanded several times and is now operated by Shawinigan Chemicals, Ltd.

Use of acetylene as a chemical raw material was started in the United States at Niagara Falls, N. Y., in 1927 by the Niacet Chemicals Co. When operations started Niacet was a joint subsidiary of Union Carbide, Du Pont and Shawinigan. Shawinigan and Du Pont later withdrew.

Niacet is now being operated by the U. S. Vanadium Division of Union Carbide.

In addition to vinyl chloride, which is being produced from acetylene by several companies, Du Pont is operating two other plants using acetylene as a chemical raw material. Acetic anhydride, vinyl acetate, and neoprene are being synthesized on a very large scale. All of the above operations were considered to be high cost operations with the exception of the vinyl monomers and neoprene when compared to processes using petroleum as a raw material. Du Pont's latest acetic anhydride expansion near Houston, Texas, is utilizing petroleum as the raw material.

CO — H_2

Another important route for the production of aliphatic chemicals is via the hydrogenation of carbon monoxide under conditions differing from that being used by Hydrocol and Stanolind. The first, the methanol synthesis, was introduced by the Badische Anilin and Soda Fabrik in 1923 at Leuna, Germany, and by Du Pont in the United States in 1925 at Belle, W. Va. As carried out in the original plants the necessary CO-H_2 mixture was formed by the time-honored water gas reaction. Much of the CO-H_2 mixture for synthetic fuels will be produced from natural gas. Hydrocol partially burns dry gas with 95 per cent oxygen. Production from coal will probably use a version of the Winkler Process, reaction of coal with steam and oxygen. The recent price increases in natural hydrocarbon materials will make production from coal via water gas, or one of the newer coal gasification processes much more attractive.

Successful operation of the methanol synthesis depended on the then-new techniques for handling large quantities of gases at high temperatures and pressures. These were developed in order to carry out the war-spurred hydrogenation of atmospheric nitrogen for its fixation as ammonia. Introduction of the CO hydrogenation process dropped the price of methanol, the main product, from $1.25 per gallon to 55 cents per gallon.

The hydrogenation of carbon monoxide is probably the most versatile reaction known. Commercial plants which have operated or are now under construction will produce all alcohols from C_1 to C_9, all of the straight chain paraffin hydrocarbons from C_1 to waxes with a chain length approximating that of polyethylene, olefins, ketones, aldehydes and fatty acids. Isoparaffinic, naphthenic and aromatic hydrocarbons can also be produced. Control of the reaction conditions, catalyst and the CO-H_2 ratio determines the products that will be formed. For example, a zinc oxide catalyst, a high pressure and temperature gives a product consisting mainly of methanol. A cobalt-thoria-kieselguhr catalyst operating at just under 200° C. and atmospheric pressure will produce a mixture consisting primarily of straight-chain paraffins plus small but appreciable quantities of fatty acids.

In most cases the products are formed as a complex mixture, providing many difficult separation problems.

THE FINAL STRUCTURE

Such is the framework on which the aliphatic industry must build. The final architecture is dependent on many imponderables, but it will follow an outline not too far different from that indicated below. In studying this blueprint, however, it must be realized that, although the first hesitant steps have been taken, a synthetic fuel industry is a long-term proposition which will eventually involve billions of dollars.

The chemical plants which are now operating on petroleum as a raw material will continue to dominate the market for some time to come. As noted before, their share of the market will continue to expand as the plants for synthesizing fuel from natural gas come into production. Synthesis plants of one type or another are inevitable. However, their appearance can be delayed somewhat by expanding imports of crude oil. In any event, national security dictates that foreign crude must not assume too large a burden of supplying liquid fuels.

COAL HYDROGENATION

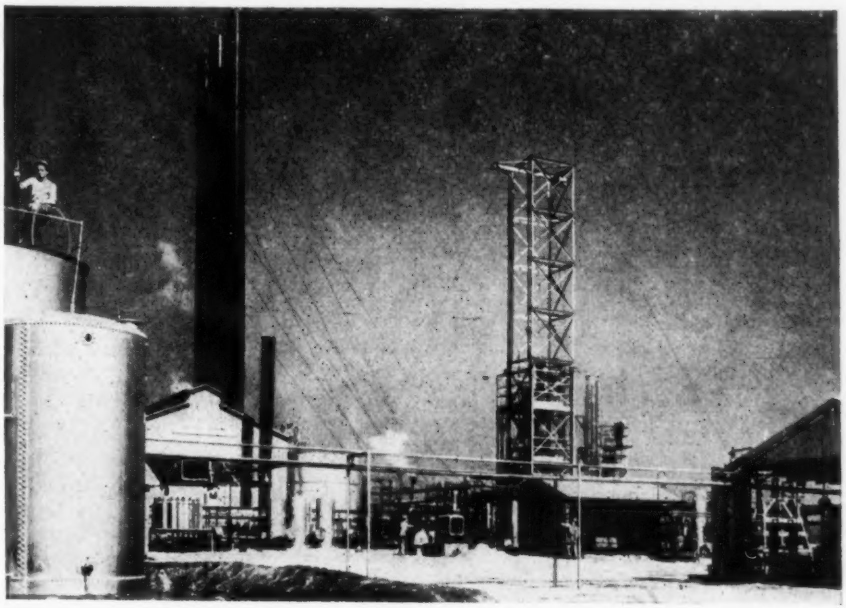
The existing knowledge on coal hydrogenation allows only a negative approach to this process as a liquid fuel source. Previous to the Americanization of the Fischer-Tropsch process it was a must for the production of high-octane gasoline. This is no longer true. However, as a means of producing a large and varied assortment of aromatic chemicals, albeit in a most complex mixture, it will enjoy a certain amount of utility in supplying the demands for the aromatic chemical industry over and above those supplied by the steel industry. One chemical company at least is backing this bet with a sizable investment.

SHALE OIL

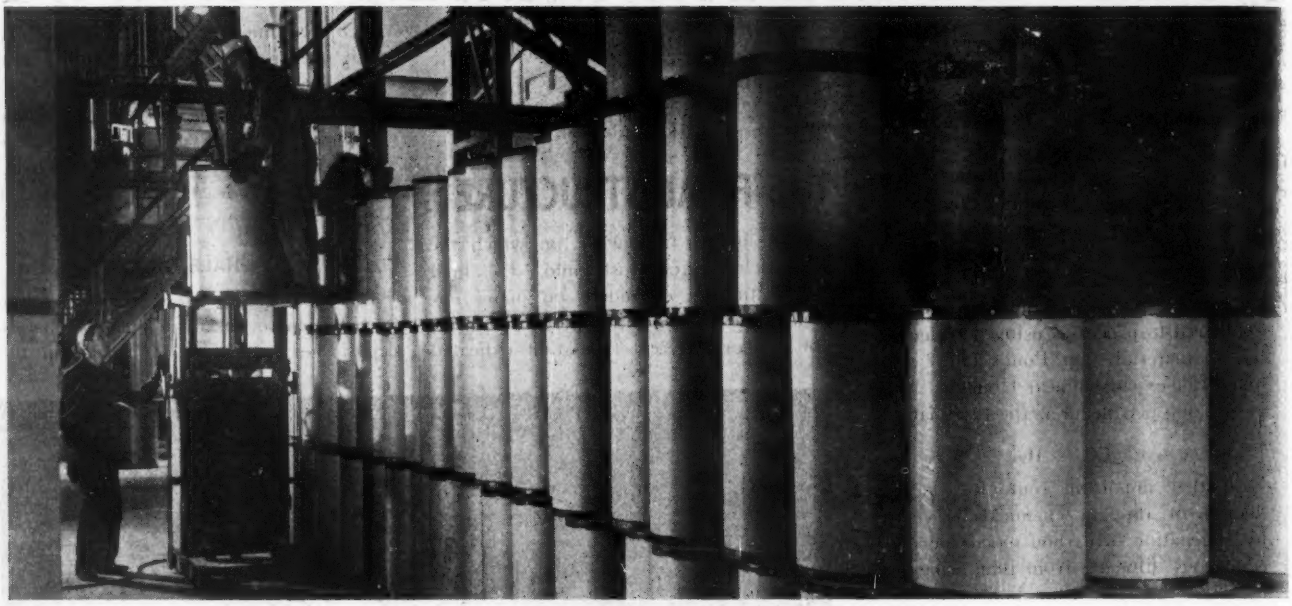
Hydrocarbons from oil shale suffer from two major disadvantages. The major deposits of oil shales are found in the Central Rocky Mountain area, far removed from their major markets. The sizable freight charge which they will have to bear reacts to their disadvantage in any price war. Also the production of hydrocarbons from shale involves "weighty" problems in the mining, heating, cooling and disposal of astronomical quantities of ash.

Synthetic fuel from natural gas, the first source, will gradually taper off into the production of liquid fuel from coal, probably from CO-H_2 mixtures formed from coal with steam and oxygen. As this change takes place, aliphatic chemicals from coal will become of increasing importance. The higher cost of coal-based synthetic fuel will favor chemical production from coal by the more direct routes. This conclusion could be changed almost overnight if our technologists should find a means of producing hydrocarbons at the price levels of two years ago.

The attendant drastic rearrangement of existing price relationships is going to produce another type of change. Many coal-based products which could not be marketed because of unsatisfactory competitive conditions may find that they are the material of choice for many uses.



The pilot plant of the Texas Co. at Montebello, Cal. can produce 5,000 gallons of synthetic gasoline per day. The new Carthage Hydrocol plant at Brownsville, Texas is being designed by Hydrocarbon Research, Inc. on their data and that gathered by the Texas Co.



A CASE STUDY IN PACKAGE SELECTION

For Chemical Products and Specialties

by HOWARD C. E. JOHNSON*
Managing Editor, Chemical Industries

BETWEEN THE PLANT AND THE CUSTOMER lies a path beset by problems, not the least of which is packaging. Pennsylvania Salt Manufacturing Company, which makes and sells a diversity of chemical products, has set up a packaging and labeling division to dig out the right answers.

UNTIL the war came along, Pennsylvania Salt Manufacturing Co. didn't have too much trouble with packages. The purchasing department handled the job, selecting and buying them after consultation with various container manufacturers.

But wartime shortages of packaging materials, together with the increasing complexity and variety of products made by the company, added immeasurably to the problems of selecting and procuring packages. The company found it necessary to carry out extensive investigations of its own, seeking suitable substitute materials for packaging many of its products. This work was undertaken by the technical service department. After the war the department was reorganized, and a packaging and labeling division was set up to handle that segment of company operations.

It was natural that the new set-up should be an outgrowth of the technical service department, for even prior to the war the latter group was responsible for checking the accuracy of labels—seeing that they complied with Federal and state regulations, that they embodied the recommendations of industry associations, that they went beyond these wherever possible to supply complete and accurate information to the buyer.

WHO DOES WHAT

Selection of a package must start long before the first pound of a new product is sold. It starts, in fact, when the research and development department is convinced that it has a new marketable item.

The packaging and labeling division confers with the development group, and together they outline a program for eliciting the information necessary for package selection. Perhaps more physical and chemical data on the product are required—especially as regards its behavior in contact with the usual packaging materials. Is it alkaline? Is it hygroscopic? Does it embrittle paper? Does it corrode steel? Does it dissolve paraffin wax? How viscous is it (if it is a liquid)? Does it tend to sift (if it is a powder)? Does it have an unpleasant odor?

After this pertinent information is obtained, the sales department is consulted on the type of package required—drums, barrels, or carboys for industrial use, or small packages for consumer trade. The advertising department is called in to advise on eye-appeal and design.

At this point a container committee is usually assembled, consisting of a representative from each of three groups: the packaging and labeling division, the purchasing department, and the production department. The representatives pass, respectively, on (1) which containers are suitable; (2) which of those are commercially available at the time; (3) which of the latter can be handled conveniently by the packaging machinery at the plant in question. Sometimes existing equipment has to be adapted to a new job; sometimes new equipment must be purchased.

A tentative selection of a package is made after consideration of the aforementioned factors, but a final decision cannot be reached until practical use tests have been carried out. For a household product, which may sit on a shelf for weeks, storage life is especially important.

If storage and other tests are successful, a package specification is drawn up to provide the necessary information for

* Based on interviews with the personnel of Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.

the affected departments. In any case the selected package must conform to specifications of the Interstate Commerce Commission or the Consolidated Freight Classification.

E PLURIBUS UNUM

Package selection is actually a problem of choosing "one out of many." Considering the variable factors of size, style, materials, etc., and the possible combinations of each, the number of commercially available packages is truly staggering.

The choice is confined to those containers which are commercially available. The company once used bottles pressed from its own dies, but procurement proved to be too expensive and inflexible. Now only standard bottles of the manufacturer's design are used.

Usually a suitable container can be found which meets the requirements; i.e., it is economical, protects contents during transportation and storage, resists corrosion, complies with legal standards, and is convenient to use. Container manufacturers themselves are helpful in making the selection: They often submit samples of containers for testing, or they take samples of the company's product into their own laboratories for study. In exceptional cases the company—either directly or through industry associations — works together with package manufacturers to develop suitable containers.

Benzene hexachloride, on account of its unpleasant odor, is a good example of a hard-to-package product. Powder formulations are now being experimentally shipped in wax-laminated, glassine-lined kraft bags or in fiber drums with a plastic wax coating. Certain solutions of the material are corrosive, and investigations are now under way to find suitable lining materials for metal containers.

Prevention of odor transmission is only one example of the problems posed by chemical products. Finely divided solids tend to sift out of any but the tightest packages, and extreme care must be taken in the choice of closures. Granular solids are easier to package, and one can use paper and cloth bags, metal and fiber drums, and slack wooden barrels. Corrosive solids, such as hypochlorites, are packaged in chemical-resistant, lacquer-lined cans of bonderized black plate.

Liquids generally present more corrosion problems than solids and often require glass or coated metal containers. Other factors to consider are volatility, flash point, coefficient of expansion, and viscosity. Highly viscous liquids usually require a full open-head container; at the other extreme, a liquid used (as in a household) in very small quantities at a time may require a very small "oil-can" type of spout.

PRICE NOT EVERYTHING

Packaging generally boils down to the question: Which is the most economical container that does an adequate job? "Generally" is an important word in that sentence, for there are other factors which may direct the choice to a containier other than that which price alone would dictate.

A new liquid household product, for example, is often packaged in glass instead of metal—simply because glass is the safest. Not until long-term storage tests are completed can it be determined whether less expensive materials are just as satisfactory. Also, where cleanliness and complete freedom from contamination are essential (as in pharmaceutical-type products), glass may be used permanently. More often, though, glass is used for the initial marketing stage—before a product is permanently established and before its storage characteristics are well known.

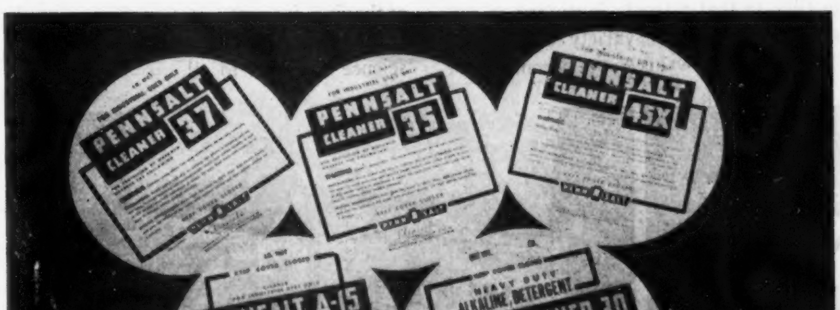
Similarly, molded screw tops are more expensive than metal ones, but they are often used when the nature of the product is one that the metal caps would corrode and stick.

Customer preferences, relayed to the packaging division by the sales department, also play an exceedingly important role. Buyers may prefer fiber drums, for example, because they can re-use them for shipping their own products. They may also prefer to receive the product in 50-lb. bags, easily handled by one man, rather than in 300-lb. drums. As unit packages become smaller, economy dictates the use of paper or cloth bags. They have an additional advantage in that they can be stored empty in a small space; and this becomes increasingly important as the number of containers per ton of production becomes larger. These and similar reasons underlie the fact that more and more of the company's products are being packaged in multiwall paper bags.

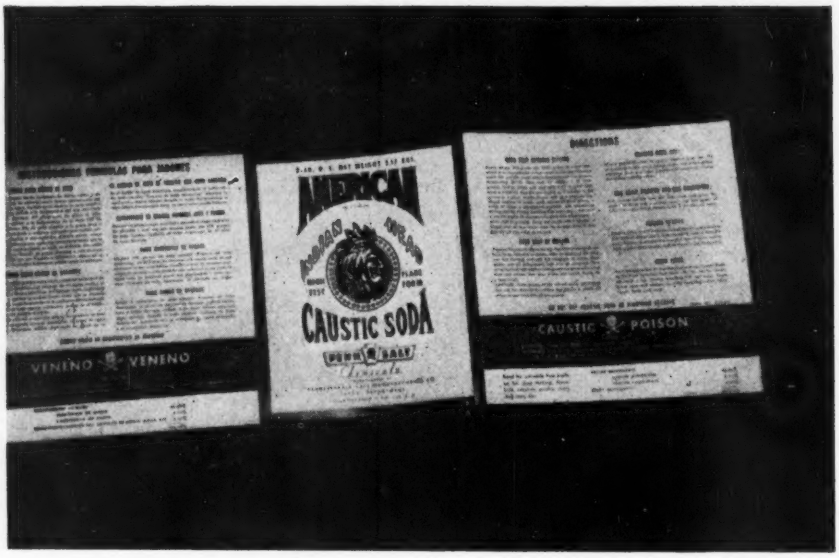
The company uses packages of many sizes and descriptions, from ¾-oz. bottles up to 900-lb. hydrofluoric acid drums—a 19,200-fold range; and most of them have to be kept on hand. As a result, purchase orders very often specify a shipping schedule: so many units a week for so many weeks. The plant manager tries to keep the container inventory at a 7-10 days' supply.

WORDS AND COLORS

Identifying the product, getting across the company name, and giving adequate directions and precautions in compliance



Each sales division uses a characteristic type of label, but all employ the company-wide motif of yellow and blue (and sometimes red). These labels are applied to tops and sides of drums.



Labels for export are printed in Spanish as well as English. South American insects ate paper labels, now cans are lithographed to avert injury from inability to identify contents.

with regulations is a function as indispensable as packaging.

A preliminary sketch of the label is submitted by the advertising department for the sales department's approval. Meanwhile the text is prepared by the technical division of the sales department and checked for technical accuracy and legal compliance by the packaging and labeling division.

SAFETY FIRST

A label cannot merely look good and sound good; it must comply, both in design and wording, with the legal requirements of various Federal and state governmental bodies. Hazardous chemicals in interstate commerce are governed by the Interstate Commerce Commission, insecticides by the U. S. Department of Agriculture, etc.

Labeling of consumer items, in particular, requires special attention in regard to directions and precautions. Many normally harmless products may have deleterious effects if they are used unwisely. For that reason the company must go beyond mere regulations in preparing such labels, for any harmful accident resulting from use of the product may boomerang, however unfairly, on the manufacturer.

The company's cleaning compounds have one style of label, its agricultural products another, and similarly in each division; but all are designed in the color scheme of yellow and blue, red being used occasionally as a third color. If the same product is packaged in a variety of containers, the same label design is used on each.

Drums carry labels both on the top and on the sides so that they can be identified when stacked. Under consideration now is a plan to encircle the drum with an identifying tape, enabling recognition even if the drums are stacked with the label away from the aisle. Fiber and composition containers are paper-labeled, and bags, of course, are printed directly.

Whether metal cans are paper-labeled or lithographed depends on a number of factors. Lithography is usually reserved for products in large and continuous demand. For small quantities the process is more expensive, but the price differential tends to disappear as larger quantities are involved. Printed labels are more flexible in that a single inventory of cans may be used for a variety of products. They tend to wrinkle or become loose, however, and in export trade, particularly in South America, they are sometimes eaten away by insects. Again—analogous to the choice between glass and metal containers—printed labels are used until a new product becomes firmly established. Then, if the demand is regular and sufficient, lithography replaces printing and pasting.

EXPERTS NEEDED

The Penn Salt personnel who contributed to this article testified that they are not packaging experts. Their opinions and policies in regard to packaging and labeling grew, not from study of an organized body of knowledge, but out of experience. They decried the fact that few if any men are academically trained to an appreciation of the over-all problems of packaging and labeling. Some are experts on drums, others on bags; but few—perhaps none—are familiar enough with the whole field to come up with the right answers without a lot of hard work.

Whatever success Penn Salt has had in meeting and overcoming the multitude of problems that arise in connection with packages and containers is due, not so much to the genius of a particular individual or to the all-embracing knowledge of a single department, but rather to the organizational set-up whereby the various departments contribute data on their special needs to a coordinating head. Such an approach, fruitful though it has been, is of necessity empirical. The "science" of packaging, from the over-all standpoint, is still in an embryonic stage of development.

ACADEMIC DEVELOPMENT

Schools and universities, they believe, might well give to packaging problems some of the same attention given to problems of production, administration, and marketing. They are just as universal. Organized study of the factors involved and the materials available could raise packaging from the status of an esoteric art, known to the experienced few, to a science available to all.

Drum labels and printed bags carry out same design.

Salesman's sample case illustrates diversity of packages.

A Practical Approach to Sound Labor Relations

by O. C. COOL, Director, Labor Relations Institute, New York

GOOD LABOR RELATIONS can make a big difference in employee accomplishment, which is something that takes on added meaning as production costs crowd prices. Here is the substance of what a good company labor relations program aims to do, and some suggestions for getting one started.

Witco Chemical Co.

"Put yourself in the employee's shoes!" is a tested maxim for management.

I AM often asked, "When we start a labor relations program, where is the right place to begin?"

The answer could easily be, "Everywhere—and at once!" A well-rounded program of employee relations has many "starting points." All too often, one has to begin by correcting some emergency situation, such as an unbalanced wage structure filled with inequities which have created "sore points" which have festered and led to a slowdown or to plant-wide low morale, or perhaps a supervisory breakdown which has permeated lower management, with a resulting bad effect on the rank and file. Then the only thing one *can* do, before launching a long-term program, is to cure the infection before building up the patient.

There are a number of ways to approach the problem of where to begin in cases where no emergency situation has arisen to set up its own vexatious priorities. There is, for instance, the legal approach. The Labor Management Relations Act, for example, provides a skeleton or framework on which one can begin, by setting up procedures and methods which place one's plant in conformace with the requirements of the law. Other laws of the Federal Government place their imprint on labor relations; they include the Fair Labor Standards Act, the Portal Pay Act, the minimum wage law—and there are state laws to reckon with, as well.

Union negotiations, and ensuing relations with the union, also provide a nucleus of needs—grievance handling, wage scales, foreman relations with shop stewards, rest periods, shift differentials, seniority, transfers, fringe benefits, management prerogatives, etc. All too many companies have had no labor relations worthy of the name until a framework of this nature has been imposed upon management as a result of the collective bargaining process.

The introduction of some basic change—such as a new incentive wage, or a reorganization of the work-force due to new plant layout or new labor-saving equipment—often provides a "starting point" of its own. In many cases where such changes are under consideration, a broad labor relations program develops out of the need for "selling" the change—and its benefits—to the employees and the community.

HUMAN RELATIONS APPROACH

In the absence of compelling factors which themselves dictate how and where the program should commence, there is an alternative approach which, more than any other, possesses the virtue of employer good will toward the workers. That is the human-relations approach, born of a desire to unify and harmonize all elements in the plant into a single, unconquerable team. To me, it is the best approach of all, because it is bedded firmly in the rock of human sympathy and common understanding. It succeeds where others frequently fail, and its fruits are long lasting. It begins with a realization, on the part of management, that employees, regardless of rank in the plant and position in the community, have definite aspirations, hopes, attitudes, likes and dislikes—and that these in turn have a bearing on their feeling toward their jobs and their employers.

"Put yourself in the buyer's shoes!" is a time-tried principle of salesmen. "Put yourself in the employee's shoes!" is a tested maxim for management. What *does* the average worker expect of his employer? Here are some of the major things he has in mind—and all of them are rungs on the ladder toward sound, well-rounded employee relations.

1. *Job Security.* This is a basic urge, one which cannot be waved away or disregarded. It is the fundamental reason for unions; if there were no insecurity, or fear of insecurity, unionization would not be the factor it is today. Everything that counters and overcomes the fear of separation from the job is in the interest of good labor relations.

The incompatibility of labor-saving devices and job security is more imaginary than real. Case after case could be cited in which modernization and technological change have *created* job security—at higher wages and better profits, and with substantial reductions in prices. Even a program which includes separations for some can be "sold" to the remainder—and their union. We at The Institute know—because we solve such problems again and again, in the ordinary course of our work.

Insecurity is not just a matter of relations between the individual worker and his company. Declining sales due to recessions or shortages; rising prices which jeopardize the worker's budget; basic changes in demand for the company's products—all weigh on the intelligent employee's mind. He feels he has a right to know how things are going with the company, because everything he has is at stake. That is why he craves information about the company's progress—and why he should be protected against rumors that make him feel insecure.

2. *Significance as an individual.* It is becoming bromidic, but is nonetheless true, that every worker is an individual human being with a personality all his own—not just a cipher on a list of numbers. Good labor relations respects his individual dignity in many other ways—by giving him every possible choice in the selection of teammates; by coupling a "reason why" with every order or plant regulation; by protecting his health through safety programs and sanitation; by providing adequate and attractive facilities for lunch and rest periods; by planning and conducting recreation and social activities, and by capitalizing every opportunity to "build up" employees in their own eyes and in those of their fellow-workers.

3. *A chance to get ahead.* "Where do I go from here?" is a fundamental question with most employees. Hence the importance of training plans and promotion schedules which give them a chance to earn more money and to do work involving higher skills. "Getting ahead in the world" is an old-time American custom; it is also a force for good wherever it is used—and used properly.

4. *Fair-and-square compensation.* This

(*Turn to page 501*)

Emergency Handling of Hot Flammable Liquids

by J. H. JOHNSEN, Engineering Department
Standard Oil Co. (Ind.)
Whiting, Ind.

PRACTICALLY ALL CHEMICAL PLANTS process large quantities of hot flammable liquids. Because of the fire hazard their emergency disposal is a major safety problem. The author describes procedures which have been adopted by a major petroleum company for safe disposal of such liquids.

PROCESSING of hot flammable liquids gives rise to one of the more serious safety problems in the process industries. Because of the high degree of flammability and huge quantities handled, the petroleum industry bears the brunt of the problem. Therefore, the procedures which they follow will serve as a guide to all. The higher unit cost of most chemicals and the necessity of preventing contact of some of them with water will call for certain changes.

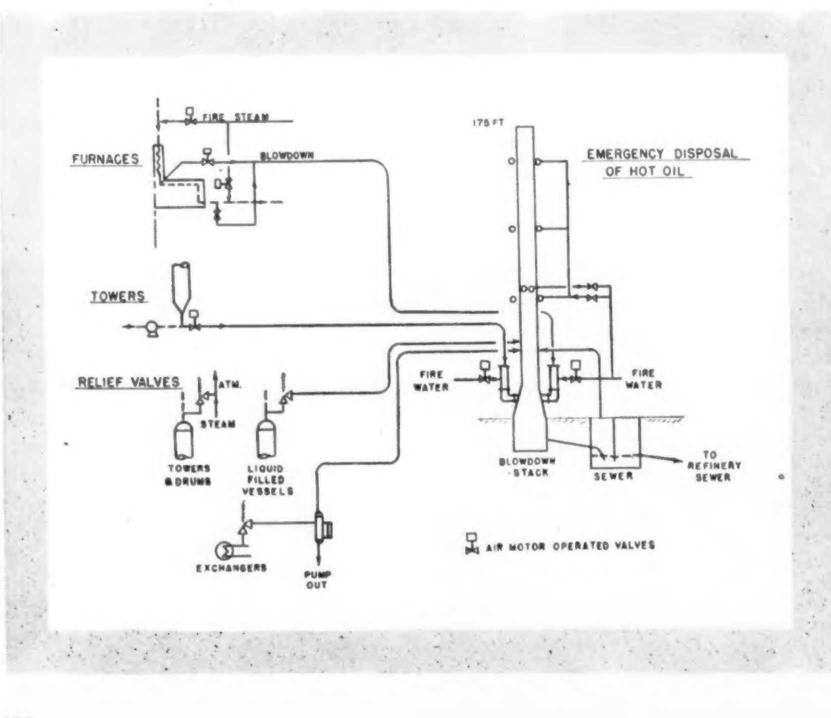
TYPES OF FACILITIES

Two types of drain and vent, or blowdown, facilities are available. The type used depends primarily on the vapor pressure of the material being discharged. Hot oils with a low vapor pressure are released into a system where they are cooled by quenching with water. The liquid and vapor are separated, the liquid passing to the sewer and the vapor being vented to the atmosphere through a stack. Gases and cold oils are released to a drum which is vented to the outside through a flare stack, the gases usually being burned at the top of the stack and the cold liquid pumped to storage for reworking.

AIR-MOTOR VALVES

Air-motor rather than electric-motor-operated valves are used because they can better withstand the high temperatures caused by an external fire. Also they are not put out of order during the emergency by a possible power failure. All air-motor valves are operated from a central control station, located for maximum safety and accessibility. The valves are surrounded by insulated housings for fire protection.

The illustrated system for the disposal of hot oil from a catalytic cracking unit is typical of most types of units processing hot oil.



FURNACES AND TOWERS

The furnace is blown down by opening air-motor-operated valves in the blowdown line from the convection section. The radiant section can be drained by manually operated gate valves connected to the transfer lines. Admission of steam through air-motor-operated valves via either the furnace-inlet or furnace-outlet transfer lines clears the furnace. In the latter case the steam passes through the radiant section of the blowdown line. Where there is a large volume of material at high pressure downstream of the furnace, automatic blowdown from the transfer line may be provided.

Air-motor-operated valves are generally provided in the blowdown lines from the furnace inlets in order to remove as much of the oil as possible from the furnace as liquid.

Hot oil towers are generally blown down through air-motor valves in blowdown lines from the pump suction line from the bottom of the tower. The valves are as close to the suction line as possible to avoid long dead ends which might plug upstream of the valve.

Relief valves can be considered as an emergency means of disposing of hot oil in addition to the aforementioned blowdown facilities. Relief valves on vessels and exchangers are designed to relieve excessive pressures resulting from any type of stoppage in the outlet lines, failure of reflux or cooling systems, external fires, thermal expansion or vaporization in exchangers, or tube failure in exchangers. Relief valves, releasing liquid oil, are connected to the blowdown stack or to some closed system.

RELIEF VALVES

Heat exchanger relief valves are released into a collecting drum, vented to the blowdown stack, from which liquid oil can be pumped out. Such a drum is usually provided where there are a large number of exchangers, so that relief valve leakage can be easily detected and measured and kept out of the sewer.

Vessel relief valves that discharge vapor are vented to the atmosphere through lines extended to safe elevations above surrounding equipment. Snuffing steam is connected to each vent through a combination steam and drain line so that discharged vapors can be diluted with steam to prevent ignition. In some cases it is desirable to discharge vapor relief valves into a closed system. Here atmospheric venting is usually provided because of the simpler arrangement of the discharge piping. In a closed system large discharge lines are required to minimize back pressure. When dual relief valves are used, interlocked or three-

way shutoff valves are required in the discharge lines to allow removal of either relief valve.

QUENCH WATER

Air-motor-operated valves, operated from the central control station, are provided in the fire-water lines to the quench nozzles. Fire water is also supplied to internal and external spray rings in the upper sections of the stack via manually operated valves, usually located in the water pump room.

Water and quenched oil are separated from steam and oil vapors at the base of the blowdown stack. In some cases, to obtain lower separation velocities, a quench and separating drum is also provided, vented into the blowdown stack. Water and oil flow from the stack (or quench drum) through a sewer gas trap with its upstream side vented back to the stack, and then to the sewer.

The blowdown stack is located in the vicinity of the furnaces and hot towers to shorten the blowdown lines and minimize the fire hazard to the other equipment. For large units it is preferable to run blowdown drainage to the sewer alone rather than with other drainage because of the large volume to be handled. Also the possible foaming of the oil-water mixture would cause resistance to flow of other drainage from the unit if a common line were used.

Due to the large volume of oil and water handled when a unit is blown down, and considering the infrequency of the blowdown, it is usually not practical to install facilities for keeping blowdown oil out of the sewer system. It is recovered at the refinery separators. Chemical plants may require a modification of the above due to the much higher unit value of the material being processed.

SMALLER SCALE EQUIPMENT

In pilot plant and laboratory scale equipment the smaller quantities of material involved usually necessitate some departure from the elaborate facilities which have been described. However, the principles involved should be followed whenever required to provide a safe installation. Generally relief valves and venting facilities are provided for pilot plants, but liquid disposal is accomplished by draining into barrels after the equipment is cool. Sewer traps are provided wherever necessary to prevent fires in the system from spreading.

Based on a paper presented at the joint technical meeting of Standard Oil Co. (Ind.) and subsidiaries, French Lick, Ind., May, 1947.

Handling Acetylene under Pressure

THE TECHNIQUES DEVELOPED FOR HANDLING ACETYLENE under pressure did not avert an occasional decomposition. They were directed primarily towards prevention of detonation and holding any decomposition that might occur under control.

THE RECENT rapid increase in the cost of petroleum hydrocarbons is changing many concepts of the cost of the raw material supply for the aliphatic chemical industry. Acetylene was the first raw material used by the synthetic aliphatic organic chemical industry and has been used successfully for many years in competition with the newer petrochemical processes. Increased prices for petroleum hydrocarbons will throw even greater emphasis on its use.

In addition to the time-honored processes for converting acetylene to aliphatic organic chemicals, the work of the Germans during and immediately preceding World War II must be considered. They were carrying out acetylene reactions at much higher temperatures and pressures than were heretofore considered safe. These reactions have not only opened new vistas in the shape of new products but have also reopened the question: Under what conditions is acetylene safe?

HOW DOES ACETYLENE EXPLODE?

An understanding of the mechanism of acetylene explosions is required before entering upon any further discussion. Under certain conditions acetylene decomposes explosively to carbon and hydrogen with the release of a large amount of energy, 53,000 kg. cal./mol of gas. Qualitatively it has been known for a number of years that the decomposition is affected by such factors as pressure, temperature, type of ignition, gas concentration, size of the container, etc. Because of the greater ease of decomposition at higher pressures and temperatures and pressures, acetylene reactions heretofore have always been carried out at moderate temperatures and pressures. Similarly acetylene generators are not usually operated at pressures above 1.5 atmospheres. (Higher pressures are forbidden by law in most countries.) Initiation of the explosion in such generators is caused by spot overheating of the solid carbide.

Acetylene decomposes in two different ways. The decomposition may be relatively slow with a gradual pressure rise (as in the usual process of combustion) or it may be very fast—a detonation. The latter represents the limiting speed of the former. With no heat loss the maximum final pressure for the slow type of decomposition is approximately twelve times the starting pressure. In the case of a detonation this figure will be many times higher. Equipment can be designed to

ACETYLENE DECOMPOSITION

1. The decomposition pressure for pure dry acetylene increases with increasing vessel diameter up to 200 mm.
2. The decomposition pressure in a large chamber decreases with increasing igniter temperature.
3. Higher temperatures decrease the decomposition pressure.
4. Water vapor raises the decomposition pressure.
5. Liquid water is a desirable component of the system.
6. The decomposition pressure of acetylene, when mixed with other gases varies with the constituents of the "other gases."
7. When acetylene is used in long pipes there is no pressure region in which the decomposition progresses slowly.
8. Experiments on explosion arrestors were without success.
9. Admixture with nitrogen raises the pressure limits for the detonation.
10. Large open spaces must be avoided.
11. Large pipe sizes cannot be installed in a vertical position.

withstand pressures developed by slow decomposition, but, except for very small vessels it is usually impractical to design equipment to stand detonation.

HANDLING TECHNIQUES

The proper techniques for handling acetylene have been developed primarily on a rule-of-thumb basis over a long period of years. However, the rules developed are only of limited assistance when it is desired to use acetylene under wholly different conditions. It was eventually determined that compression to 15-20 atmospheres should take place in slow-moving reciprocating compressors by stages with intercooling. Storage cylinders and large diameter vessels should be filled with some inert material such as kieselguhr or raschig rings.

Because of the shortage of Germany's petroleum resources, acetylene played a large part in her program of self-sufficiency in the chemical industry. Many of the processes developed used acetylene, and safe operation required much more definite data on the limits of acetylene's explosibility. This information was provided by a series of investigations by I. G.

The results of these investigations can be expressed as follows:

1. The decomposition pressure for pure dry acetylene increases with increasing vessel diameter up to a diameter 200 mm. A further increase seems to have no effect.
2. The decomposition pressure in a large chamber decreases with increasing igniter temperature. For example, fusion of a lead wire (330° C.) gives a decomposition pressure of 7.5 kg./cm.^{2} while with fusion of platinum or molybdenum (1700° C.) it is 1.40 kg./cm.^{2}
3. A rising temperature decreases the decomposition pressure; at 15° C. it is 1.40 kg./cm.^{2} and at 180° C., 1.08 kg./cm.^{2}
4. Water vapor raises the decomposition pressure. However, the actual partial pressure of the acetylene is practically constant.
5. Liquid water is a desirable component in the system. It is a stabilizing agent because of its large heat absorption potential. This serves as an explosion arrestor by making it more difficult for hot spots to start.
6. The decomposition pressure of acetylene, when mixed with other gases, depends on the constituents of the other gases. For example, the decomposition of the acetylene content, in the series of gases tested by the Germans was the least with methane and the highest for hydrogen. Recent experiments at the U. S. Bureau of Mines indicate that butane is the most effective diluent.
7. Experiments on the use of acetylene in long pipes show that there is no pressure region in which the decomposition progresses slowly and it undergoes detonation at relatively low pressures. Detonation produces a pressure of several hundred atmospheres.

   In very long pipes a slow decomposition will usually turn into a detonation. A thirty meter length of pipe is all that is usually required for this conversion to take place. Elbows in a pipe line are not sufficient to prevent spread of decomposition.

   Larger pipe sizes cannot be installed in a vertical position as convestion factors favor the change of a slow decomposition into a detonation.
8. Admixture of nitrogen raises the pressure limits for the detonation. Up to 25 per cent nitrogen does not have much effect in preventing detonation other than raising the starting point slightly. 50 per cent nitrogen is required before a real increase in the pressure limit can be obtained. For such mixtures there is some evidence which indicates that a small pressure range exists where no detonation takes place even with strong ignition.

   For pipelines a pressure limit of 3.0 kg./cm. with a one-to-one nitrogen-acetylene mixture was set. A pressure of only 0.3 kg./cm. was permissible when pure acetylene is used.
9. Many experiments were made on explosion arrestors, but without success. However, a porous stone filter was used for this purpose between the compressor and the autoclave in the Koresin plant.
10. Large open spaces must be avoided. Realization of this is indicated by the specifications for the Schkopau butinediol plant.
    a. All pipelines carrying acetylene under pressure are to be filled with small tubes of a half-inch maximum diameter.
    b. Elbows are to be filled with such tubes and with steel raschig rings when this is not possible.
    c. Large empty spaces are to be strictly avoided. Dished heads of vessels, etc., are to be filled with raschig rings.

How effective these precautions were is indicated by the fact that although decompositions occurred in the butinediol plant on six different occasions there were no detonations. No pipelines were blown open except those softened by intense heat. The plant was designed with the expectancy that decompositions would occur, necessitating a shutdown and a complete cleanout of the equipment.

STILL TO BE DETERMINED

There was one type of pipeline rupture which was not previously noted. The first of several unexplained acetylene decompositions was observed a few days after starting operations in the Huls plant for the production of acetylene by the arc cracking process. An elbow in the acetylene line began to heat up, became red hot and burst open in a few minutes. The pipe was not shattered; it appears to have been softened from intense heat and then split by the system pressure. This took about fifteen minutes.

In spite of the many precautions it is surprising that more explosions did not occur in view of the operations so near the explosive limits. The safety measures stemming from the foregoing did not stop decomposition entirely but did limit those that occurred to the non-detonating type. Liberal and judicious use of nitrogen as a diluent and the avoidance of hot spots in the system appear to have been the most important safety measures which were utilized.

Adapted from FIAT Final Report 720, "German Techniques for Handling Acetylene in Chemical Operations", by N. A. Copeland and M. A. Youker.

THICK ALUMINUM WELDS

WELDING thick aluminum plate was a must for the new synthetic gasoline plant of Carthage Hydrocol, Inc. Here 95% oxygen, 2000 tons per day, is first produced from air. It is then reacted with natural gas to give synthesis gas, CO-H_2, for synthetic gasoline formation. Oxygen section temperatures may reach −280° F.; pressures, 100 p.s.i.

Inability to weld thick aluminum plate has heretofore prevented its use. Development of argon-shielded tungsten-arc welding at the Battelle Memorial Inst. in a study sponsored by the Stacey Bros. Gas Construction Co. is a solution. The joining of 2½" slabs is shown.

An Ounce of Prevention Minimizes Lead Hazards

by J. E. HATFIELD, Works Manager
Willard Storage Battery Co., Cleveland, O.

A bag-type dust collector frees exhausted air of lead dust, thus safeguarding the public.

LEAD POISONING IN A CHEMICAL PLANT is easier to prevent than cure. Proper equipment, continual emphasis on safety rules, and frequent examination by a competent physician can eliminate disability from this case.

ALTHOUGH Government statisticians consider the storage battery industry in the electrical machinery and equipment classification—separate and distinct from the broad chemical industry—there are safety problems in the use of lead and other materials that are more or less common to both industries.

A major problem is the health of a worker who continually handles oxides of lead. It is well known that under certain conditions the human body will absorb sufficient quantities of lead, primarily through the respiratory tract, to cause the individual worker to become sick. The U. S. Department of Health in its various publications, has stated that 1.5 milligrams of lead per 10 cubic meters of air is the maximum amount of lead that a worker can breathe over prolonged periods of time and avoid harmful absorption of lead into the body. It is important to remember that quite definite limits of safe exposure have been established.

There are two ways in which any plant can proceed when it knows that injurious concentration of lead dust exists. One method is to attempt to evade the problem by not admitting its existence—continuing as best one can in treating the lead absorption cases as though they were other ailments. The other approach, preferable by far, is to admit that there is a problem that must be dealt with if the exposed workers are to contine to enjoy good health. At the time a worker is employed, it is the best policy to tell him frankly that he is gaining employment in a factory where a health problem exists, and then seek his cooperation in abiding by the rules and regulations that have been established to control lead absorption by the workers within a plant. Throughout the plant it is well to continue to impress upon the workers, by such means as posters, that at all times when they are handling lead oxides, they must be careful not to do anything which will raise the lead oxide dust into the air to be breathed and later absorbed into the body.

It is well to remember that if a competent medical man makes a frequent periodic check of a lead worker's physical condition, he can usually detect quite early any signs of lead absorption. If the case is detected before the absorption has been too great, steps may be taken which will restore the worker to good health and in no ways interfere with his normal work activity.

Since an ounce of prevention is worth a pound of cure, the fundamental problem is to prevent lead dust from getting into the air. To meet this, engineers are searching for better methods of keeping the dust out of the air.

Some methods have already proved of value. For example, where lead dust collects or is dropped on the floor, a grill floor with fresh flowing water underneath to catch the lead dust oftentimes is very effective. Of course, the structure of this grilled floor and its supports must be such that it will safely carry the heavy weight passing over it. On most working operations, a grilled floor must be supplemented with various exhaust systems by which lead dust is withdrawn from the working operation in such a manner that a worker will not be exposed to the dust he or other adjacent workers have made.

There are many arguments among engineers as to whether the exhaust should be up-draft or down-draft. It is impossible to say that one or the other is best for all cases. For some operations a combination of both up- and down-draft may be best. But in any case, exhaust hoods can be used effectively to prevent lead dust from contaminating the air on a particular operation.

Where lead dust would collect on the floor, a grill with fresh water flowing underneath to carry away the particles, is employed.

Another important phase of the program to keep workers from absorbing lead dust is the use of some method for determining the amount of lead dust in the air. There are several methods available including the electrostatic collector, the impinger, and the slide count. All have been used and each has certain advantages. It is important that the officials of a given plant know their own conditions.

The health problem of workers in the lead consuming industries needs every bit of support management can possibly give it. Many states have State Health Codes which cover their particular area, but these Codes within themselves vary so widely that one must consult his own. He should see that his own state's minimum code requirements are met, and then go as much further as is possible.

Legal Decisions in 1947 of Interest to Chemical Makers and Sellers

by LEO T. PARKER, Attorney at Law
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EXCLUSIVE OF THOSE PERTAINING TO PATENT MATTERS, the year 1947 saw some significant decisions handed down by the courts which will be of interest to manufacturers and sellers of chemicals.

DURING the year 1947 the higher courts rendered a number of outstanding decisions involving chemists, chemical manufacturers, and buyers and sellers of chemicals. Some of the more significant of these are reviewed here.

First, we should like to answer a letter recently received from a reader. This letter asks: "Are chemists in an enterprise that is engaged only in research subject to wage payments specified by the Fair Labor Standards Act? Also, is an employment contract valid which compels employes to work overtime without extra wages?"

It is important to know that all higher courts consistently hold that the primary purpose of the Fair Labor Standards Act is not so much to regulate interstate commerce as it is to prohibit the shipment of goods in interstate commerce that have been produced under substandard conditions. Such being the purpose of the Act, it follows that it cannot apply in the absence of goods which may be shipped in such commerce.

This important decision was handed down by a higher court in the case of Atwater v. Gaylord, 184 Pac. (2d) 437, reported November, 1947. In this case a company paid employes $1.50 an hour, but the venture was a failure and no goods or chemicals were produced

The employes sued the company for several hundred dollars each for overtime work. The higher court held the employes not entitled to a recovery, saying:

"It would seem to be elementary that in such case labor employed in such futile search or exploration cannot come under the Fair Labor Standards Act, for by no possible stretch of imagination is any interrelation between such labor and commerce, let alone interstate commerce, conceivable."

For comparison, see Gill v. Electro Corporation, 146 S. W. (2d) 352. In this case employes of a corporation did a lot of experimentation, during which time the corporation was not engaged in any production for commercial use.

The employes perfected the process and thereupon entered interstate commerce by selling its product and from that time on the company paid its employes in accordance with the provisions of the Fair Labor Standards Act. The question was as to whether or not the employes came under the Act while the experimentation was going on. The court held that they did *not*, and stated in part:

The Fair Labor Standards Act does not apply when employes are not engaged in producing goods for commerce.

"We think there is a clear distinction between experimenting in an attempt to produce or to discover a desired commodity or remedy and manufacturing that article or remedy for commercial purposes after it has been perfected. . . . For many years chemists have been laboring in laboratories in an attempt to find a remedy for the cure of cancer, with an intention of manufacturing and selling it commercially when discovered. But it would be absurd to say that these chemists are engaged in commerce or in the production of goods for commerce."

OVERTIME PAY

According to a late higher court decision a contract is lawful by which employes agree to work without additional payment for overtime. This is so if the contract clearly states that the daily or weekly wages *include* time and one-half for overtime above 40 hours a week, and double time for Sunday work.

See Watson v. Hightower, 176 Pac. (2d) 670.

Hence manufacturers and sellers of chemical products who require overtime work must pay extra for it or must make written contracts with employes. These contracts must specify a daily or weekly wage which is not less than 40 cents per hour for 40 hours each week and equal to the wages regularly paid employes in similar work; plus time and one-half for over time; plus double time for Sunday work.

For example, the minimum weekly wage for any employe who, we shall assume, works eight hours every day, including Sunday, or 56 hours weekly is figured, as follows: First, forty hours times 40 cents an hour equals $16.00; Eight hours at 60 cents an hour is $4.80; Eight hours at 80 cents an hour is $6.40 or total $27.20.

RIGHT TO SOLICIT CUSTOMERS

According to a recent higher court it is unlawful for a salesman to use his ex-employer's list of customers.

For illustration, in Wallich Laboratories v. Koren, 181 Pac. (2d) 682, it was shown that for several years the Wallich Laboratories maintained a laboratory in which it employed skilled chem-

Overtime work must be specially paid for unless there is a contract which clearly states that the daily or weekly wages include payment for overtime.

ists for the creation of his products. On July 17, 1940, it employed one Koren as a salesman by written contract whereby Koren agreed to solicit business from the trade over the routes designated. The salesman was supplied with a list of customers and prospects within the specified territory with their addresses and other valuable information relative to them. Koren continued to solicit Wallich Laboratories' customers until April, 1944, when the employment was terminated. Seven months later Koren re-entered the field of his former employment and commenced to solicit and to sell merchandise to Wallich Laboratories' customers on the routes formerly traveled by him.

The Wallich Laboratories filed suit and asked the court to grant an injunction to prevent Koren from selling to or soliciting the purchase of merchandise and supplies from any of these persons who were customers of Wallich Laboratories on the routes previously traveled by Koren. The higher court granted the injunction and also held Koren liable in damages to Wallich Laboratories. This court said:

"Our civilization has passed beyond the era of cut-throat competition. Not only do business men deprecate practices that deprive one's neighbors of his rights, but the ethic that abounds among upright men is to let rivals live and, if a competitor deserves success, so to act as to defeat the piracy of such advantages as he may have honorably acquired."

For comparison, see Chemical Fire-

It is unlawful for a salesman to use his ex-employer's list of customers.

proofing Corporation v. Krouse, 155 Fed. (2d) 422. In this case a salesman for Chemical Fireproofing Corporation signed an employment contract which stated that for a period of three years the salesman would not engage, as a competitor, in the solicitation of the employer's customers. After one year the salesman terminated the employment and went into the same business on his own, accepting business from his former employer's customers. The higher court held that the salesman could continue in the business, saying:

"We think the three year provision is an unreasonable and invalid restraint, from the standpoint of time as well as territory. The area covered by this agreement is extremely wide when viewed in the light of what appears to be the character of the business."

This court indicated that such a contrait is valid if the duration does not exceed one year and the specified territory is no larger than covered by the salesman.

STORED GOODS NOT TAXABLE

Modern higher courts consistently hold that a state law is valid which prohibits the state from taxing merchandise in warehouses. And such a law is applicable although the chemical corporation's own employes distribute the merchandise.

For illustration, in Dearborn Chemical Company v. Taxation and Finance, 53 Atl.

Contracts are void which agree to transport freight for less than legal rates.

(2d) 639, the testimony showed facts as follows: The Dearborn Chemical Company is a corporation of the State of Illinois, maintaining offices in the City of New York with its principal place of business in Chicago. It maintains no office in the State of New Jersey. The corporation leased space in a warehouse of the Lackawanna Warehouse Company in New Jersey in which it stored chemical products in drums, barrels and carboys. The corporation had employes at its space in the warehouse who made shipments on orders received from the New York office.

In view of a state law which exempts from taxation personal property in storage in a public warehouse, the higher court held that the State of New Jersey could not compel the corporation to pay state tax on chemicals stored in the warehouse, although the corporation's own employes made shipments from the warehouse.

For comparison, see Anglo-Chilean Nitrate Sales Corporation v. Alabama, 288 U. S. 218. Here a shipment of 100-pound bags of nitrate were kept intact until delivered to purchasers. The higher court held that the state could not tax the packages of nitrate.

CAN COLLECT FREIGHT CHARGES

A common carrier can collect legal charges from all shippers. See Shattuck Chemical Company, 158 Fed. (2d) 909, where a carrier instituted suit to recover

No state, county or city shall tax merchandise imported and left in the original package.

for undercharges, alleging that the legal rate applicable to the shipments was $2.17 per hundredweight.

The shipper proved that the carrier had agreed and contracted to route the shipments by the cheapest routes and rates available, and that there were available routes over which the chemicals could have moved for a rate of $1.84.

Nevertheless the higher court entered judgment for the carrier for the total amount of the several undercharges, with interest thereon. This court indicated that all common carriers must collect legal freight rates and that contracts are void by which they agree to transport freight for less than legal rates.

NO TAX ON "ORIGINAL PACKAGE"

A United States statute provides that no state, county or city shall tax goods, materials or merchandise imported and left in "original package". But the instant a package is broken, the contents are taxable by the state.

In E. J. Stanton & Sons v. Los Angeles County, 177 Pac. (2d) 804, Stanton & Sons imported merchandise and sold it at wholesale and retail. The testimony showed that after a shipment was received, from time to time sales were made from the merchandise.

Under these circumstances, since the merchandise was not allowed to remain in its *original packages,* the higher court held that the state and county could tax it.

CUSTOMER GETS DERMATITIS

According to a recent higher court there is an implied warranty on the part of the seller and manufacturer that the article sold is free from hidden defects.

For example, in Marra v. Jones Company, 170 S. W. (2d) 441, it was shown that one Marra purchased for her own use a wine colored satin blouse and paid $1.95 for it. Marra wore the blouse to her work as a clerk. In the afternoon of that day she noticed an itching sensation around her neck and arms. She did not wear the blouse again, but on the next day every part of her body where the blouse had made direct contact was a solid mass of red pimples. Blisters appeared and they burst, others formed,

Employers are legally obligated to warn employes of special dangers when using chemicals.

and infection spread where the blisters came in contact with her skin.

Marra sued for damages and her physician testified that the cause of the dermatitis and irritation was from the garment she wore. Also, a chemist testified that he made an analysis of a sample of the blouse and found the cloth to contain a benzidine dye and a trace of iron, some tin oxide, and about fifteen milligrams of lead and 0.001 milligrams or arsenic per square inch.

The jury awarded Marra $3,000 damages.

MUST WARN EMPLOYES

Modern higher courts consistently hold that employers are legally obligated to warn employes of special dangers when using chemicals, and also supply the employes with special clothing to protect them against injuries and burns.

For instance, in Levesque v. Clearwater Mfg. Company, 41 S. E. (2d) 92, an employe sued his employer for $5,000 damages. The employe alleged that the employer used poisonous chemicals which caused him to become ill.

The employe contended that before he was permitted to use the chemicals his employer should have warned him of the dangers and furnished him with proper safeguards.

The higher court allowed the employe $1,000 damages and said that all employers should warn employes of special dangers and also supply necessary "safeguards" to the employes.

CAN SUE FOR DAMAGES

Modern higher courts consistently hold that the State Workmen's Compensation Act protects employers from suits by injured employes *for damages.* In other words, an injured employe cannot recover compensation and also damages. However, where the employer fails to supply safety devices or proper clothing his employes may recover damages.

For example, in Peerless v. Pharr, 40 S. E. (2d) 106, it was shown that an employer did not furnish an employe with rubber gloves to protect him from a chemical solution. Consequently the chemical poisoned the employe.

This court held that the employe could sue the employer for damages.

This court also held that all employers must use reasonable care and diligence to provide a safe place for employes to perform work. Failure to do so results in the employer being liable in damages, if the employe cannot recover compensation under the State Workmen's Compensation Act.

"ACID" NOT AN ACID

In many instances employers may avoid liability for alleged sickness or injuries to employes by having expert witnesses testify to certain facts.

For example, in Clark v. Southern Corporation, 11 So. (2d) 17, an employe filed suit and testified that for six years he worked with acids and that he was compelled to walk and stand on the floor where the acid accumulated. The employe alleged that these chemicals caused the palms of his hands and soles of his feet to become calloused and cracked, and that this condition prevents him from performing labor of any kind.

Where an employer fails to supply safety devices an injured employe may recover damages.

During the trial a chemist testified that the chemical used by the employe was neither an acid nor an alkali but a harmless neutral liquid. Therefore, the higher court refused to allow the employe damages.

HANDS ARE POISONED

According to a late higher court decision it is dangerous and also compensable for an employe to expose his hands to gasoline containing tetraethyl lead.

In Perrotta's Case, 64 N. E. (2d) 19, it was shown that an employe was furnished by his employer with gasoline containing tetraethyl lead, a toxic substance which he used for removing spots from rubber. His hands were injured and he became afflicted with anemia and arthritis. The employe sued to recover compensation under the State Workmen's Compensation Act.

The higher court awarded the employe compensation without comment.

WHOLESALER SUED

A wholesaler is not liable for defective chemical merchandise which he purchases from a manufacturer who falsely advertises it.

For example, in Cochran v. McDonald, 161 Pac. (2d) 306, the testimony showed that a manufacturer of an antifreeze solution, for use in motor vehicles, gave the agency for the distribution of its product to a wholesaler who purchased a large quantity of the antifreeze. The antifreeze was put up in sealed gallon jugs and to each jug the manufacturer affixed a label upon which was printed an absolute guarantee that the product would protect the cooling system from freezing for a full winter season, and that it would not cause rust or deteriorate the hose or other parts of automobiles.

Many of the purchasers to whom the wholesaler sold the antifreeze sued him for "great damage" done to their automobiles. An analysis of the antifreeze showed that it contained highly corrosive elements and was unfit for the purpose designed. The higher court refused to hold the wholesaler liable, and said:

"The inherently dangerous character of the article was not known to respondent (wholesaler) . . ."

Also, this higher court refused to hold the wholesaler liable on the guarantee advertised by the manufacturer, saying:

"It must follow, therefore, that the respondent is not liable to appellant upon the express warranty of the manufacturer."

Obviously, the manufacturer is the proper party to sue.

NO INVENTION

Many higher courts have held that it may be patentable invention to use an old process, machine, or composition of matter for a new and non-analogous purpose. However, with respect to chemicals an inventor may obtain a valid patent only where the new use is so remote from established uses that the thought of making the necessary modifications and changes and applying it to the new use would not occur to a person skilled in the art and seeking means by which the desired function could be performed.

For example, in Migrdichian, 156 Fed. (2d) 250, it was shown that an inventor filed an application for a patent on seed disinfectant compositions containing certain organic mercury derivatives.

The Court of Customs and Patent Appeals refused to grant a patent saying that the invention was disclosed in prior U. S. patends Gornitz, 2,145,594, and Callsen, 2,119,701.

A CI REPORT ON

CELLULOSE

Its History, Growth, and Influence

by MERLE HEATH*

NOT ONLY IS CELLULOSE A RAW MATERIAL for chemical synthesis, but in its own various physical forms it competes with chemically-made products. Moreover, the production and modification of cellulose provides an important market for chemicals and at the same time releases by-products suitable for chemical utilization. Thus, at these points and at many others does the cellulose industry touch the chemical industrty; and so extensive is the former that any changes in its size, products, or techniques exert a palpable influence on the latter.

CELLULOSE is produced so universally and abundantly in the plant kingdom that its adaptation by mankind for shelter, clothing, and communication reaches back into the misty depths of history. The growth of civilization has been accompanied by a natural and continuous growth in the use of cellulose so that there has never been a separate "cellulose age."

If we may concede a modern "chemical age," however, with an enormous development of synthetic materials having custom-made properties for all kinds of uses, it is of interest to evaluate the current position of cellulose in this picture.

CELLULOSE DEVELOPMENT

Originally, cellulose was used as produced in nature, with only the simplest of modifications. The seed hairs of the cotton plant were twisted into yarn and woven into cloth. With the aid of fermentation, the best fibers of the flax plant were separated and converted into another textile, linen. Trees were cut into lumber or used for fuel. The Egyptians laminated thin strips of the stalk of the papyrus plant and produced a writing surface. The Chinese made the first true paper by macerating cotton or linen cloth into pulp and recovering the fibers as a thin sheet.

For centuries cotton and linen rags were the raw material for the papermaker. But with the invention of printing, demand for paper became so great that, by the middle of the eighteenth century, there were not enough rags available. In 1719 the French scientist, de Réaumur, suggested to the French Royal Academy that paper might be made from wood. He had observed that wasps in making their nests produced a material from wood that closely resembled paper. de Réaumur did not follow up his own suggestion experimentally (for which he condemned himself in after years) but other inquisitive and practical men such as Jacob Christian Schäffer in Bavaria, Léorier Delisle in France, and Matthias Koops in England began making paper from various cellulosic materials. The wood-pulp industry was born, and later, in the nineteenth century, chemical processes were developed to separate cellulose from other constituents of wood so as to obtain a stronger and whiter paper.

Beginning with Jean Baptiste Payen in 1838, agriculturists, botanists, chemists, and other investigators tried to isolate cellulose and find out more about it. This was difficult; and the main obstacle was its inertness—which, at the same time, was one of its most valuable properties. However, as chemical knowledge increased, cellulose was subjected to chemical reactions. It formed explosives with nitric acid, and the commercial manufacture of guncotton and smokeless powder was established. Moreover, the nitrocellulose compounds were soluble in organic reagents, so the cellulose could now be dissolved and regenerated in a different form. Copying the silk worm, a solution of cellulose nitrate might be extruded through a minute opening and the solvent evaporated to leave a solid filament which could then be converted back to cellulose again by splitting off the nitric acid. Count Hilaire de Chardonnet exhibited this "artificial silk" at the Paris Exposition in 1889. Commercial possibilities were recognized, and the rayon industry eventually resulted. The same chemical derivative of cellulose, nitrocellulose, of a low combined nitric acid content, mixed with camphor to soften or plasticize it, was celluloid, and from it developed the field of modern plastics.

Other cellulose derivatives were produced—cellulose xanthate, or viscose, cellulose acetate, and the cellulose ethers—each having certain commercial advantages as textile or plastic materials. Thus, viscose and cellulose acetate now dominate the rayon field, while nitrocellulose continues to be important in plastics and lacquers. Not only was cellulose regen-

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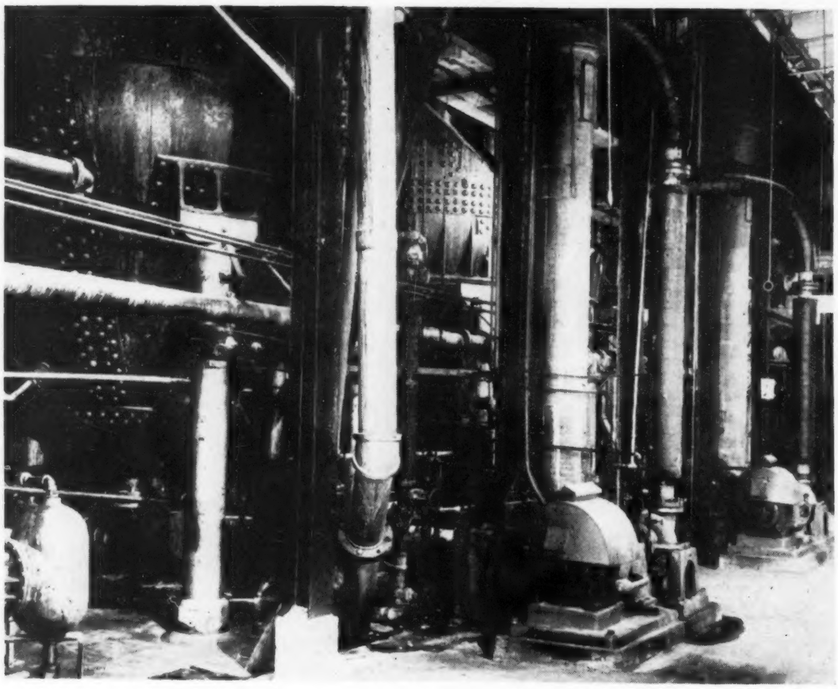


Kimberly-Clark Corp.

Wood chips are digested to pulp in this battery of digesters.

erated from solution as a filament, but it was formed as a transparent sheet which could be rendered flexible and moisture-proof—cellophane. Each new development brought about new uses for the products, and increased consumption of cellulose.

CHEMISTRY ELUCIDATED

In the meantime, fundamental research had succeeded in casting a great deal of light on the chemical composition and physical structure of native cellulose. It was concluded that the basic molecule is a long chain, the links consisting almost exclusively of the simple sugar unit, glucose, but with these units firmly joined to each other (with elimination of a molecule of water) by primary valence bonds. Secondary valence forces tend to hold the chains together in compact bundles, although the strength of these forces, like magnetism, depends on how closely individual chains approach each other and so are not equally effective throughout the entire fiber. Thus, part of the structure is readily accessible to water and dilute acids, whereas the areas in which the chains are regularly arranged and "crystallized" can only be penetrated and the structure broken down by more drastic chemical reagents and conditions of temperature or pressure.

Length of the chains does not seem to be uniform, although there is some uncertainty as to the original conditions in nature since any procedure which is used to isolate cellulose from its environment may break some of the primary valence bonds and, consequently, shorten the length of these chains. Even cellulose from the purest natural sources, such as cotton, however, seems to be composed of chains of cellulose molecules of different lengths. In native cellulose, average molecular length is considerable—e.g., 3000 or more glucose units. But in commercial pulps the chains have been shortened by the purification process so that they usually average less than 1000. And in making chemical derivatives the chains become shorter still. The longer the chains, the more firmly the structure holds together, up to a certain limit, and so it is important in pulping to regulate the operating conditions so as not to reduce the average chain length below the critical point; otherwise strength will suffer. It appears, too, that the relative proportions of short-, medium-, and long-chain molecules influence overall properties of the material, although much more evidence is needed on this point.

Increased scientific knowledge about cellulose has been of great assistance in guiding practical commercial production. It is now possible to produce a very pure cellulose, even though this involves loss of a good-sized fraction of the shorter chains. This purified cellulose, sometimes termed high-alpha cellulose, is needed for the production of chemical derivatives, although it makes up only a small percentage of total cellulose used.

COMMERCIAL SOURCES

Cellulose may be obtained from any plant. Commercially, however, availability, yield of the crop in weight per unit area per year, percentage of recoverable cellulose which it contains, and cost of isolating and purifying this cellulose from the raw material must be taken into consideration. On this basis, only a few sources are of commercial importance. By far the most important is trees—preferably coniferous trees. Cotton and cotton linters provide the purest and most easily obtainable cellulose. Waste paper is a very important source for the paper and paperboard industry, as, to a lesser degree, are cotton and linen rags. Straw and flax are used in limited fields. In England esparto grass is a source of writing and printing papers. Manila and hemp, obtained as salvage rope, used to be a good source of cellulose for the papermaker, although it is now relatively insignificant. Bagasse, the residual pulp from the sugar cane, is used in manufacture of building board. Considerable research has been done on utilizing ramie, bamboo, and donax cane and paper has been made from cornstalks.

While cotton cellulose is primarily consumed in the textile industry, scarcity of rags and the difficulty of identifying and sorting out synthetic textiles which are not compatible—not to mention resins, rubbers, and all the various water-repelling, fire-proofing, and finishing agents—has led manufacturers of rag and rag-content papers to partial substitution of raw cotton. Cotton linters, the shorter, fuzzy hairs which appear on the cotton seed shortly after the longer cotton staple or lint begins to form in the growth period of the cotton plant, is a by-product of the cottonseed-oil industry, so the commercial production is tied in with the economics of that industry. First cut linters is used principally for low-grade textiles, mattresses, and stuffing, some going into papermaking and chemical cellulose. Second cut linters is raw material for rayon, cellulose plastics, lacquers, explosives, and conversion products in general, and as a substitute for rags in papermaking.

Table I: Consumption of Fibrous Materials in the Paper and Paperboard Industry

(Dept. of Commerce, Bureau of the Census)

	1939 Thousands of Tons	1939 Percent	1946 Thousands of Tons	1946 Percent
Wood pulp	8,650	61.0	12,092	58.3
Waste paper	4,366	30.8	7,278	35.1
Straw	513	3.6	535	2.6
Rags	468	3.3	402.5	1.9
Flax	(no separate statistics)		61.5	0.3
Manila stock	64	0.5	8	0.04
Miscellaneous	115	0.8	375	1.8
	14,176	100	20,752	100
Production	13,509		19,157	
Lbs. production per lb. raw material	0.953		0.923	

The data in Table I indicate a shift in sources of cellulose for the paper and paperboard industry since 1939. More waste paper is being salvaged and reused. The percentage of rags has declined, and more of the unclassified or miscellaneous fibers, including raw cotton, are being used. Flax, which is an important source of pulp for cigarette paper, now merits a separate classification. Manila stock has almost faded out of the picture although, with a recovery of world trade, this condition might change.

It is interesting to note that, with increased use of waste paper, average yield

of paper and paperboard products per pound of raw material has gone down.

WOOD PULP

The pulp and paper industry is based on wood pulp, although it accounts for less than 10 per cent of total annual timber removal in this country as compared with over 40 per cent for lumber. In wood, the cellulose and related compounds are very intimately intermingled with lignin in a ratio of about two or three to one. The yield of wood pulp depends on the pulping process which is used. If the wood is merely ground against an abrasive wheel, the yield is high, for no attempt is made to separate the constituents. If the lignin is chemically altered and dissolved out by chemical pulping and further reduced by bleaching, the yield may be less than half the original wood, since a good share of the shorter and more soluble cellulose chain molecules and lower-molecular-weight related materials (the "hemicelluloses") are dissolved also.

Table IIa presents a compilation of operating statistics of the U. S. wood pulp industry ten years ago and in 1946. Complete data for 1947 are not available as this is written, but they will undoubtedly show a marked increase in production over 1946. The changeover from wartime to peacetime conditions has progressed further, labor-management relations have been more stable, weather conditions have not been too unfavorable, and more pulp has been brought in from Sweden. In the first three quarters of 1947 production increased 13.7 per cent, imports 26 per cent, and the net new supply of pulp 14.9 per cent over the same period in 1946.

In Table IIb some comparisons are made, using the statistics of Table IIa. From 1937 to the beginning of 1947 our wood pulp industry increased its total capacity 52.6 per cent and its total production 61.4 per cent. In 1946 it operated at 87.4 per cent of capacity, compared with 82.7 per cent in 1937. Foreign trade fell off as a consequence of World War II; wood pulp imports were 25 per cent lower and exports decreased 87.8 per cent. Less than 0.4 per cent of total production was exported in 1946. The net new supply of pulp (production plus imports minus exports) was 43 per cent greater, and total wood pulp consumption was 103.6 per cent of rated capacity, compared with 109 per cent in 1937. In other words, the U. S. was more nearly self-sufficient as regards pulp supplies in 1946 than in 1937, although still dependent on imports for 14.3 per cent of the pulp used.

The shifts in pulping procedures over this period are significant. The production of specially purified bleached sulfite pulp for use in rayon and other cellulose derivatives has decreased. Consumption of these pulps, on the other hand, has

Table IIa: Statistics of the Wood Pulp Industry, 1937 and 1946.

(Units are thousands of tons)

	Capacity		Production		Imports		Exports		Net New Supply		Consumption	
Type of Pulp	*1937*	*1946*	*1937*	*1946*	*1937*	*1946*	*1937* (2)	*1946*	*1937*	*1946*	*1937* (3)	*1946* 502.2
Dissolving and special chemical grades of bleached sulfite	(1)	(1)	353.6	298.5	91.8	202.2	158.5	8.5	296.9	492.2	286.9	502.2
Paper grade of bleached sulfite	(1)	(1)	995.0	1,393.6	420.2	222.6	49.1	7.2	1,366.1	1,609.0	1,366.1	1,615.3
Total bleached sulfite	1,502.4	1,953.9	1,348.7	1,692.1	512.0	424.8	207.6	15.7	1,653,0	2,101.2	1,653.0	2,120.5
Unbleached sulfite	991.5	953.8	791.6	784.4	919.7	618.6	105.0	16.9	1,606.2	1,386.1	1,606.2	1,474.9
Total sulfite	2,493.8	2,907.7	2,140.2	2,476.5	1,431.6	1,093.4	312.6	32.6	3,259.3	3,487.3	3,259.3	3,595.3
Bleached sulfate (kraft)	270.7	881.8	215.2	749.8	111.8	75.1	0.5	0.8	326.5	824.1	326.5	833.2
Unbleached and semi-bleached sulfate (kraft)	2,260.4	4,495.2	1,923.9	3,838.2	622.4	402.5	1.5	4.7	2,544.9	4,236.1	2,544.9	4,308.0
	2,531.1	5,377.1	2,139.1	4,588.0	734.2	477.6	2.0	5.4	2,871.3	5,060.2	2,871.3	5,141.2
Total sulfate (kraft)	703.4	493.9	507.5	476.2	10.3	19.7	8.0	0.1	509.9	495.8	509.9	492.4
Soda	(4)	353.6	132.5	319.3	0	0	0	0	132.5	319.3	132.5	319.3
Semi-chemical/Chemi- fibre: and Chemi-	196.2	..	43.2	158.3	0	8.6	2.0	1.2	41.2	165.7	41.2	168.8
	196.2	353.6	175.7	477.6	0	8.6	2.0	1.2	173.7	485.0	173.7	488.1
cal screenings												
Total chemical pulp	5,924.5	9,132.2	4,962.6	8,018.4	2,176.2	1,599.3	324.5	39.4	6,814.2	9,549.2	6,814,2	9,738.1
Groundwood (+ screenings)	2,023.6	2,201.1	1,610.3	1,826.6	218.4	245.3	0	0	1,819.1	2,071.9	1,819.1	2,086.9
Defribrated/exploded	(5)	796.8	(5)	761.5		0		0	(5)	761.5	(5)	761.1
Total wood pulp	7,948.2	12,130.2	6,572.9	10,606.5	2,394.6	1,794.7	324.5	39.4	8,645.0	12,361.8	8,645.0	12,565.0

Notes: (1) Bleached sulfite capacity not separated for these two grades. (2) Data available for exports to Japan and Gt. Britain only for 1937. (3) No independent figures on consumption available for 1937; assumed to be approx. equal to the net new supply. (4) No separate capacity estimate for semi-chemical pulp in 1937. (5) None before 1940.
Source of data: "Wood Pulp Statistics", The United States Pulp Producers Association.

Table IIb: The Wood Pulp Industry, Percentage Comparisons, 1937 and 1946.

	Capacity			Production					Imports			Exports			Net New Supply	Consumption % of Capacity	
	% Change	% of Total Capacity		% Change	% of Capacity		% of Consumption		% Change	% of Consumption		% Change	% of Production		% Change		
Type of Pulp	*1937-46*	*1937*	*1946*	*1937-46*	*1937*	*1946*	*1937*	*1946*	*1937-46*	*1937*	*1946*	*1937-46*	*1937*	*1946*	*1937-46*	*1937*	*1946*
Dissolving & special chem. grades— Bl. Sulfite	(1)	(1)	(1)	− 15.6	(1)	(1)	123.2	59.1	+120.2	32.0	40.0	− 94.6	44.8	2.8	+ 71.5	(1)	(1)
Paper grade— Bl. Sulfite	(1)	(1)	(1)	+ 40.1	(1)	(1)	72.8	86.3	− 47.0	30.7	13.8	− 8.53	4.9	0.5	+ 17.8	(1)	(1)
Total bleached sulfite	+ 30.0	18.9	16.1	+ 25.5	89.8	86.6	81.6	79.6	− 17.0	31.0	20.2	− 92.4	15.4	0.9	+ 27.1	110.0	108.0
Unbleached sulfite	− 3.8	12.5	7.9	− 0.9	79.8	82.2	49.3	53.2	− 32.7	57.3	41.9	− 83.9	13.3	2.2	− 13.7	162.0	154.6
Total sulfite	+ 16.6	31.4	24.0	+ 15.7	85.8	85.2	65.7	68.9	− 23.6	43.9	30.4	− 89.6	14.6	1.3	+ 7.0	130.7	123.6
Bleached sulfate (kraft)	+225.7	3.4	7.3	+248.5	79.5	83.9	65.9	90.0	− 32.9	34.3	9.0	+ 54.1	0.2	0.1	+152.5	120.6	94.5
Unbleached and semi-bleached sulfate (kraft)	+ 98.9	28.4	37.1	+ 99.5	85.1	85.4	75.6	89.1	− 35.3	24.4	9.3	+218.0	0.1	0.1	+ 66.5	112.6	95.8
Total sulfate	+112.4	31.8	44.4	+114.5	84.5	85.3	74.5	89.2	− 35.0	25.6	9.3	+175.9	0.1	0.1	+ 76.2	113.4	95.6
Soda	− 29 8	8.8	4.1	− 6.2	72.2	96.4	99.5	96.7	+ 91.1	2.0	4.0	− 98.2	1.6	..	− 2.8	72.5	99.7
Semi-chemical/ Chemfibre	(2)	(2) 2.5	2.9	+141.0	(2)	90.3	100	100	0	0	0	0	0	0	+141.0	(2)	90.3
Total chemical pulp	+ 54.1	74.5	75.4	+ 61.6	83.8	87.8	72.8	82.3	− 26.5	31.9	16.4	− 87.9	6.5	0.5	+ 40.1	115.0	106.6
Groundwood (+ screenings)	+ 8.8	25.5	18.1	+ 13.4	79.6	82.3	88.5	87.5	+ 12.3	12.0	11.8	0	0	0	+ 13.9	89.9	94.8
Defibrated/exploded	(3)	(3)	6.5	(3)	(3)	95.6	(3)	100.1	(3)	(3)	0	(3)	(3)	0	(3)	(3)	95.5
Total pulp	+ 52.6	100	100	+ 61.4	82.7	87.4	76.0	84.4	− 25.0	27.7	14.3	− 87.8	4.9	0.4	+ 43.0	109.0	103.6

Notes: (1) No separate estimates of capacity. (2) 1937 capacity includes chemical screenings. (3) None reported before 1940.

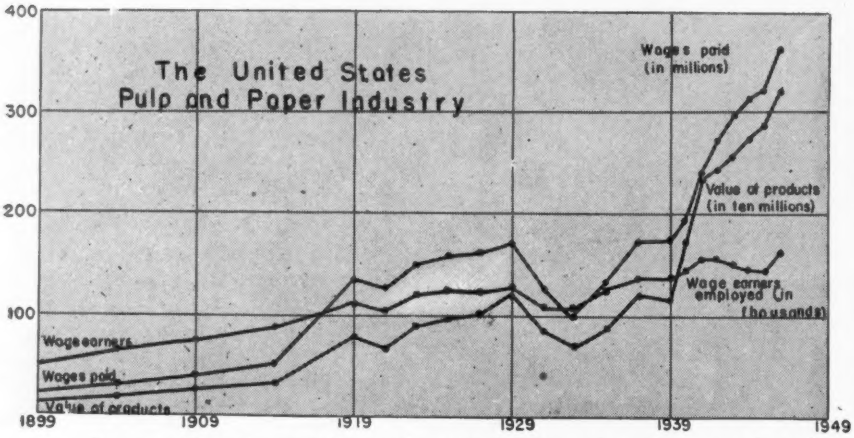


Figure 1: Operating statistics of the United States pulp and paper industry.[1]

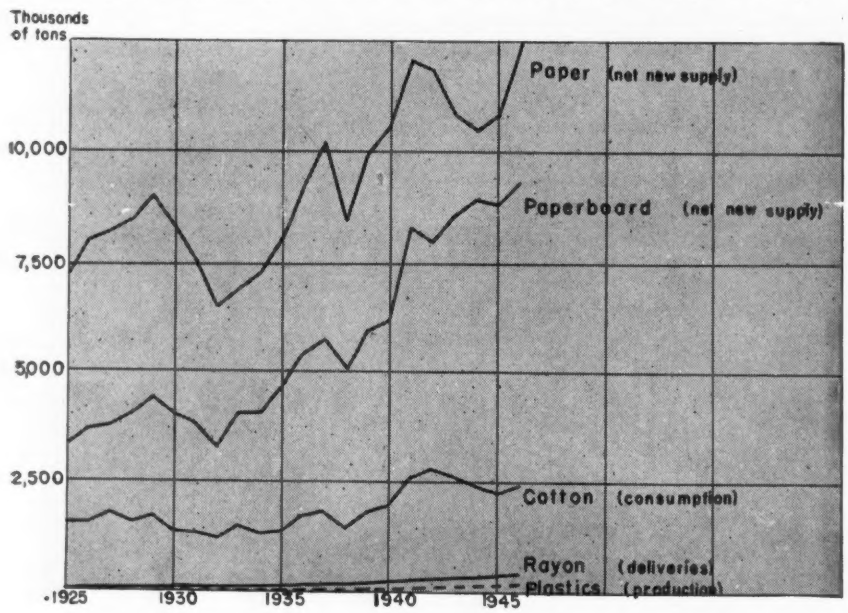


Figure 2: Yearly tonnage of important cellulose products in the United States.[2]

increased more than 70 per cent, but in 1946, 40 per cent of the supply was imported, practically all of it from Canada. In 1937 a large surplus was produced in this country (123.2 per cent of domestic consumption) but nearly half of it was exported, principally to Japan.

Increase in production of sulfite pulp as a whole has been moderate. One objection to the sulfite process has been the inability to evaporate, calcine, and recover the lime-base pulping agents. Not only are valuable chemicals lost, but disposal of waste liquor becomes a major problem, since stream pollution is being more and more strictly regulated by regional, state, and municipal authorities. Substitution of other, initially more expensive, bases—viz., magnesium, sodium, or ammonium bisulfite—is a solution which has been developed on a plant scale in Europe and is being introduced into this country.

The greatest large-scale increase in pulp production has been in sulfate or kraft pulp, which has more than doubled in this period, whereas the sulfite and groundwood types have increased less than 20 per cent. In 1946, sulfate accounted for 44.4 per cent of the rated pulp-producing capacity.

SULFATE ADVANTAGES

These are some of the advantages of the sulfate process: It gives comparable yields of distinctly stronger pulps with a much higher recovery of chemicals. A greater variety of woods, including resinous woods, can be used than in the sulfite process. Bleaching is more difficult and is a more recent development than sulfite bleaching. However, modern multistage bleaching procedures give pulps which are competitive in whiteness, and it is to be expected that research will eventually bring down bleaching costs.

More pulp of all kinds is being bleached. Bleached sulfite capacity increased 30 per cent, whereas unbleached sulfite capacity fell off about 4 per cent. Bleached sulfate capacity increased 225 per cent, compared with an increase of 99 per cent for unbleached sulfate.

In an effort to increase the yield of pulp, pulping procedures have been developed which use a mild chemical cook—not sufficient to completely soften the structure, and leaving most of the cellulose and hemicelluloses undissolved. This semichemical pulp is then disintegrated mechanically; viz., in an attrition mill or rod mill. Production of this type of pulp has more than doubled since 1937 and finds a market where color is not a critical factor.

Another type of pulp contains an even higher percentage of the original constituents of the wood. The fibers of steamed wood chips are rubbed or blown apart mechanically. This most recent category made up 6.5 per cent of the total wood pulp capacity in 1946, with a corresponding decrease in groundwood capacity; therefore, the ratio of chemical to mechanical pulp capacity in the United States remains approximately the same, at three to one.

PEROXIDE BLEACHING

One of the most important recent advances in the production of groundwood pulp has been the development of peroxide bleaching. The improvement in color and permanence is obtained with little loss in yield, and groundwood, which has superior printability over paper from chemical pulp, can now be used in types of printing papers where it formerly was limited or rejected entirely.

Another new bleaching agent coming into the pulp industry is sodium chlorite, or chlorine dioxide. Its great advantage is that it seems to have very little degrading effect on the cellulose. Because of the present higher cost, its use has been limited to highest-grade papers or as an auxiliary bleach, either as a separate stage or mixed with cheaper bleaching agents.

Methods are known in the laboratory which give an almost complete separation of all the cellulosic and hemicellulosic constituents (or "holocellulose") from the lignin; but it is doubtful if they will ever be economically feasible for commercial production.

It is not irrelevant to include Canadian production in a discussion of the U. S. cellulose industry, for it provides a considerable part of the cellulose consumed in this country. As Table III shows, Canada exported over a fifth of the pulp produced there in 1946, and nearly 90 per cent of it was sent to the U. S. This in spite of the fact that the bulk of the pulp is groundwood and is used in Canada for making newsprint—also largely for export to the U. S. The percentage of production exported increased from 16.9 to 21.6 in the past ten years, compensating to some extent for the loss in European pulp supplies during the war.

Canadian pulp production increased 27.5 per cent from 1937 through 1946, compared with a 61.4 per cent increase for

[1]Sources of data: American Paper and Pulp Association, Bureau of the Census, Bureau of Labor Statistics.

[2]Sources of data: Paper and paperboard, American Paper and Pulp Association, Bureau of the Census data; cotton and rayon, Rayon Organon; plastics, Sydney B. Self in Barron's Magazine, Jan. 5, 1948.

the U. S. A greater proportion of chemical pulp is now being produced, and this trend will be even more evident in the coming years. Several large U. S. companies now have pulp mills in Canada.

Canada is also a large producer of pulp for rayon, the bulk of it being exported to the U. S.

CELLULOSE USES

Figure 1 delineates the major end uses of cellulose in this country, covering the period from 1925 through 1946. Cotton consumption varies considerably from year to year but shows an overall upward trend. Rayon has had an almost steady growth, and currently is at a ratio of 1:6 with cotton in tonnage.

Some values for plastics are included, although the thermoplastic cellulose derivatives make up only about 18 per cent of the total production. In the lacquer and artificial leather fields, however, cellulose nitrate is practically unchallenged.

Far outstripping the textile materials, because of the greater diversity of uses, is the production of paper and paperboard. From 1937 through 1946 the yearly production of paper and paperboard in the U. S. has increased from 228.7 pounds to 319.3 pounds per capita, or an increase of about 40 per cent. The production of paper increased 29 per cent, but the production of paperboard increased 57.5 per cent, almost twice as much percentagewise. The industry in 1946 was producing about 58 per cent paper and 42 per cent paperboard products, whereas ten years ago the ratio was 63 per cent to 37 per cent.

The American Paper and Pulp Association's survey of new capacity for 1947-48 is as follows:

Table IV: Estimate of New Capacity for the Paper and Paperboard Industry.

(Units are thousands of tons)

	Capacity at end of 1946	Increases 1947	Increases 1948	Expected capacity at end of 1948
Total paper	10,520	567	667	11,754
Paperboard	9,000	370	1,041	10,411
Building board	900	419	57	1,376
	20,420	1,356	1,765	23,541

If this expected capacity is attained, paperboard (including building board) will have caught up with paper production. A total annual consumption of 350 pounds per capita is in sight.

Figure 2 shows the growth of the U. S. pulp and paper industry in the present century, with respect to number of employes, wages paid, and value of material produced.

Considering world production of cellulose, the position of the U. S. has changed markedly as a result of World War II. Figure 3 illustrates changes in wood pulp production. Growth of the industry in the North American countries, particularly the U. S., has almost offset loss of production in Europe and Japan. Northern Europe may be expected to recover rapidly under favorable economic conditions and an adequate supply of coal for power, but future conditions in Germany and Japan are more uncertain.

In production of paper and paperboard, also, the U. S. and Canada have increased sufficiently to offset losses in Europe, as indicated in Figure 4, and now account for 77 per cent of the world's supply.

The greatest percentage increase in U. S. production has been in the rayon industry. In 1937, Figure 5 shows that the U. S. ranked below Japan and Germany, while in 1946 it was the predominant producer and provided over half of the world's rayon.

In the first three quarters of 1947, U. S. rayon production increased nearly 12 per cent over the same period in 1946.

Table III: Canadian Production and Exports of Wood Pulp, 1937 and 1946.

(Production units are thousands of tons)

Type of Pulp	Production 1937	Production 1946	Production % Increase	Percent of Production Exported: To the U.S. 1937	To the U.S. 1946	Total Exports 1937	Total Exports 1946
Dissolving and special chemical grades of bleached sulfite	164.3	259.9	58.2	55.9	75.2	(1)	94.2
Paper grade of bleached sulfite	294.8	357.7	21.3	66.1	55.2	(1)	60.3
Total bleached sulfite	459.1	617.6	34.5	63.5	63.6	80.6	74.6
Unbleached sulfite	914.2	1,216.8	33.1	12.6	32.6	19.3	36.7
Sulfate (kraft)	312.7	561.3	79.5	36.4	34.5	39.3	36.5
Soda and other chemical pulp	21.9	35.1	60.2	46.3	56.0	51.8	56.0
Mechanical pulp	3,308.5	3,998.8	20.9	4.4	5.8	5.0	6.7
Screenings	125.1	125.9	0.7	18.2	15.0	18.9	15.2
Total wood pulp	5,141.5	6,555.5	27.5	13.6	19.1	16.9	21.6

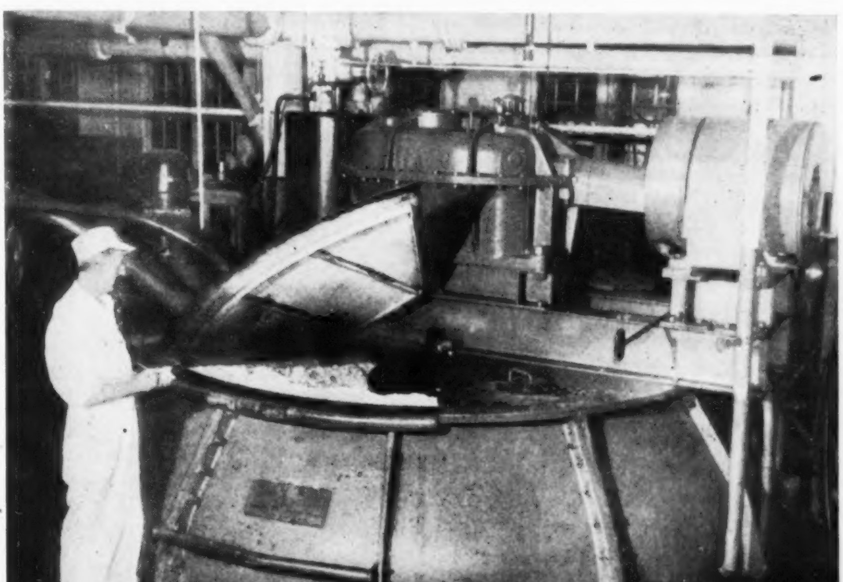
Note: (1) Separate export data not available for these grades in 1937.
Source of Data: Canadian Pulp and Paper Association, and Canada, Dominion Bureau of Statistics.

NEW PAPER AND PAPERBOARD USES

In the "chemical age," the flood of new materials has not limited the market for paper and paper products; rather it has greatly expanded their application and opened up many new fields. Paper products have always been of interest commercially because of their relative cheapness. But they had obvious shortcomings: They were not as strong, or as impervious to gases, liquids, and oils as were metals and glass; they were not flexible and elastic like rubber; they did not have the wearing qualities of textiles; and they fell apart when they were wet.

Now the technical man has seized on synthetic plastic materials and by their use has been able radically to change the properties of paper and paperboard. Paper has invaded the textile field—not enough to become a serious threat to the cotton industry but enough to provide a considerable market for this type of paper product. Melamine resins, mixed with the pulp before it goes on the paper machine, increase the wet strength many times, and the paper towel is now within the reach of everyone. The annual production of wet-strength paper is more than 350,000 tons.

Not only paper towels but paper nap-



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Further breakdown of the pulp is effected by a vortex beater.

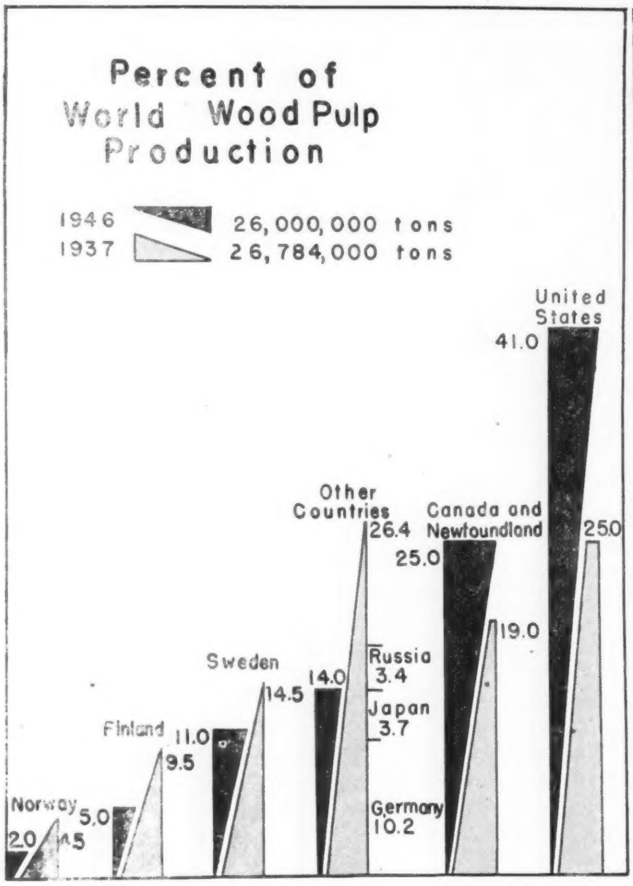


Figure 3: Wood-pulp producing countries of the world.[3]

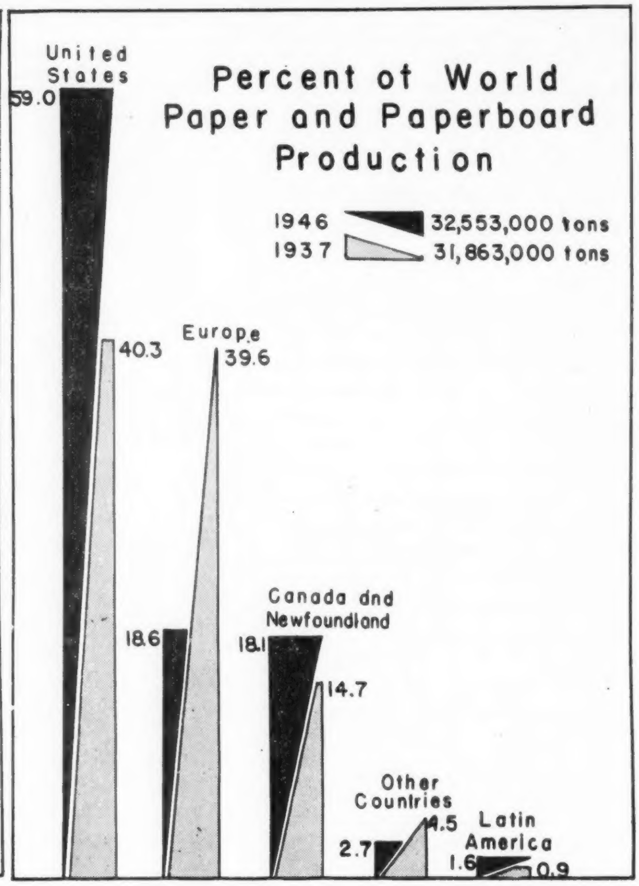


Figure 4: Paper-producing countries of the world.[4]

kins, doilies, tablecloths, curtains and draperies, handkerchiefs, surgical dressings and even hospital sheets are in use.

A second broad field of expansion in the use of paper, and particularly paperboard, has been in packaging. This was given a great impetus by the war, when it became necessary to develop a light-weight, strong, and waterproof shipping carton. The problem was solved with the use of resins. Now this type of container is finding many peacetime applications. Paper containers impervious to moisture keep vegetables, fruits, and sea food fresh; and their light weight is essential for air transportation. Another application is in the frozen food industry, which is rapidly expanding. And the same property is valuable in packaging dehydrated food products, where moisture must be kept out.

Containers are being made impervious to all kinds of liquids, oils, and greases. Milk, paint, and lubricating oil can now be handled in paper-type containers. Paper shipping bags are being used for hundreds of solid commodities. Here the bag may be made up of several layers, or laminations, of paper with other materials.

A third field of new paper uses is in molded forms. Cellulose has a place in the plastics industry, not only as a starting material for thermoplastic chemical derivatives but as cellulose fiber itself, mixed with synthetic plastics as a filler, or to modify their properties, increasing impact strength and toughness of the final product. Many kinds of structural pieces are now being molded of paper and plastics.

Instead of molding an article in one piece, resin-impregnated pulp or paper may be laminated, using heat and pressure, to form a compact, hard and strong, but relatively light-weight material. It was used extensively in aircraft during the war, and has a promising future in automobiles, cabinets, pipes and ducts, furniture, houses, and for structural purposes in general, since the properties and shape of the final product can be adapted to suit the requirements.

Paper is also being used as an outer surface for plywood, where it not only strengthens the material but makes it possible to obtain all kinds of decorative effects.

In fact, paper can be laminated with almost any substance, using the variety of modern adhesives now available, to give a two- or three-ply material, or more, with whatever special properties are required for the intended use. Metal foils, cloth, rubber, glass or glass fiber, asphalt, waxes, resins, and many other materials may be combined with paper in this way, imparting better properties to the product than those possessed by any of the constituents alone.

Needless to say, the tendency toward combining cellulose with other materials creates a serious problem in the re-use of waste paper. Many of the new products will never return to the papermaker, and a large part of those which do cannot be repulped by usual procedures. The result is a greater recovery cost because of the closer sorting and higher rejections required.

CELLULOSE FUTURE

Because of the large and growing demand for cellulose products, it is needful to examine the natural resources of raw material. The most reassuring fact is that the supply is being constantly renewed and, ideally, matters might be arranged so that new growth exactly balanced the amount used up. Actually, in many parts of the world, including the U. S., the great cellulose reserve of virgin forest has been mined with very little regard for the future, and we are now confronted with a shortage of our most desirable sources. This is not a temporary situation, although it has been more critical in the past few years because of the wartime reduction of wood pulp production in Europe. The U. S. does not make enough pulp to supply the domestic consumption, and to insure pulp supplies there has been a trend toward integration in the pulp and paper industry. Approximately three-quarters of the wood pulp consumed in manufacture of paper and

[3] Source of data: "Wood Pulp Statistics", 1947 edition. Published by The United States Pulp Producers Association.

[4] Source of data: Pulp and Paper Industry, Vol. 21, No. 5, p. 69 (April 30, 1947).

paperboard in the U. S. now comes from integrated organizations, and the percentage is rising. Converters, particularly of paperboard, are purchasing and operating mills, as are newspaper and magazine publishers. Paper mills which depend on purchased or "market" pulp are faced with an uncertain supply. More than half is imported pulp, 60 per cent of which was supplied by Sweden before the war. Price difficulties caused by OPA pulp price ceilings complicated the situation until recently, but shipments in 1947 have been more nearly normal, and will probably be increased further in 1948.

Another recent development is the announcement of the Prime Minister of Ontario that exports of pulpwood to the U. S. are to be progressively restricted so as to cease entirely by the end of ten years. Canada exported 16.5 per cent of her pulpwood in 1946, but hopes to build up and diversify her own pulp and paper industry.

In past U. S. history, as desirable species of pulpwood became scarce in one locality, the industry expanded into other localities where it was more plentiful. Thus, newsprint production migrated to Canada; the kraft paper industry went to the South where it could utilize southern pine and where the economic conditions of labor, fuel, and raw materials were favorable. With the opening of the Panama Canal and cheap ocean transportation to the Eastern seaboard, pulp mills began to locate in the Pacific Northwest. Today, new geographic locations are scarce, and to the heavy expense of building new mills must be added the development of transportation facilities and of living conditions which will insure an adequate supply of labor.

More Canadian mills are going up, with the emphasis on chemical and, particularly, sulfate pulp. There has been some agitation to develop an Alaskan wood pulp industry. The U. S. Forest Service has opened two tracts of national forest timber in Alaska for bidding. The dates of auction for each have been postponed to allow more time for interested parties to complete their plans, and are now set for this spring. Claims of Alaskan Indian tribes to the land have been advanced, but it is probable that a more serious deterrent to prospective pulp producers is the undeveloped status of the country.

CONSERVATION MEASURES

An alternative to moving into new areas is to increase production from timber stands already in use. Wood is a crop in which methods of harvesting have great influence on the quality and quantity of later growth. A much greater effort is now being made to maintain good forestry practice, particularly by the larger companies. Losses by fire are spectacular, and much attention is rightfully being paid to fire prevention measures. Losses from insect pests and disease are equally serious, however, and offer opportunities for large savings in wood supply.

Waste in obtaining and processing wood is high. A report by the U. S. Forest Service of the Department of Agriculture in 1944 on "Wood Wastes in the United States" estimated a loss of 26 per cent in logging, the bulk of it resulting from small material left in the woods or burned, the rest to destruction of smaller trees by falling timber. Closer cooperation between logging for lumber and for pulpwood can avoid some of this waste; for example, by prelogging for pulpwood. Increased mechanization in the logging industry is also reducing waste. Use of portable chippers, to utilize branches and small material in the woods has been advocated. The development on the West Coast of the hydraulic barker capable of handling full size logs also provides a great saving in wood formerly wasted.

In Europe, where it is vit lly necessary to conserve the wood supply, a good example is being set with regard to complete utilization of wood. A large proportion of Swedish pulp is made from saw-mill waste. Over 90 per cent of the Swedish lumber industry's solid waste, with the exception of bark and sawdust, is converted into pulp.

Much research is being done on pulping other species of wood, such as Douglas fir in the West, jack pine in Canada, and various hardwoods in other regions. At present 86.5 per cent of the pulpwood cut is softwood and 13.5 per cent hardwood; thus, it is evident that a greater proportion of hardwood must eventually be used. The sulfate pulping process is advantageous for this purpose. Various forms of mechanical defibrators can also be set up at relatively low cost in small units to use many species from older, second-growth forests.

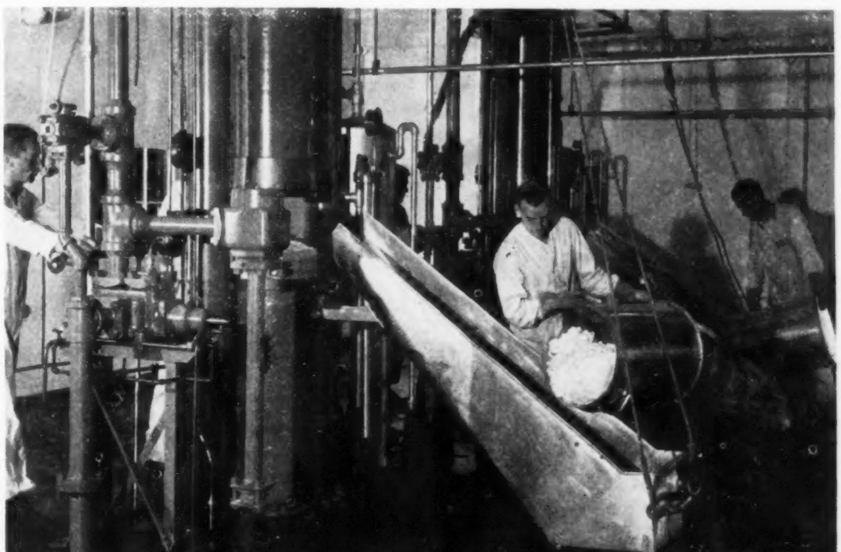
It is certainly true that large quantities of cellulosic material are lost each year as residues of annual agricultural crops. The low production obtained per unit area, and the difficulties of collecting, transporting, and storing a supply adequate for maintaining a mill in regular operation offer serious objections to their use; therefore, utilization is limited to a few special cases such as straw, flax and, to some extent, raw cotton. The government subsidy program has made raw cotton available to the rag-paper industry at a below-market cost. Experiments are also being made on growing cotton in Texas directly for the rag-pulp producers, employing a special shorter staple grade more suitable for papermaking, and using a high degree of mechanization in the planting, tending, and harvesting of the crop.

The main source of cellulose will undoubtedly always be trees, and more and more serious attention is being paid to reforestation as the only means of insuring a continuous supply of the desired species.

RAYON AND THE NEWER FIBERS

In 1938 the Du Pont Co. introduced nylon, the first completely synthetic fiber. Nylon won rapid acceptance, and other synthetic fibers were soon put on the market. The most important are the vinyl chloride-vinyl acetate copolymer, vinylidene chloride, glass, polystyrene, and polyethylene.

All of these materials have certain properties which are outstanding—in some cases far superior to the cellulosic fibers. Thus, nylon excels in tenacity, elasticity, toughness, and low moisture absorption. Vinyl resin is resistant to chemicals, and is as strong wet as dry. Glass also has high strength and chemical inertness and is completely fireproof.



National Film Board (Canada)

Damp nitrocellulose is dumped into the hopper of a dehydration press, where the moisture in the product is displaced by solvent and the nitrocellulose is compressed into a cake.

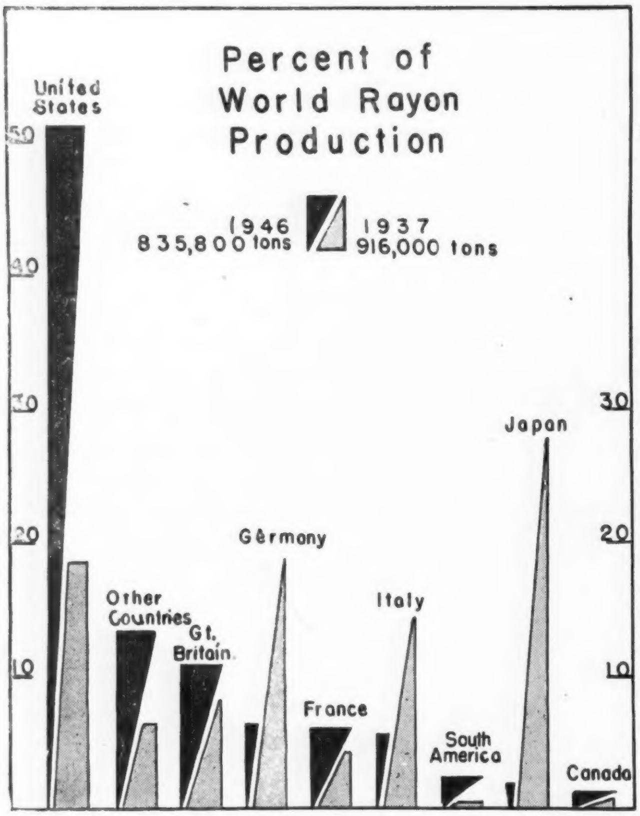


Figure 5: Rayon-producing countries of the world.[5]

Polystyrene and polyethylene are very light in weight. At the same time, each material has its problems, such as dyeing, brittleness, luster, and feel or hand of the fabric.

These special properties make for application of synthetic fibers to special purposes. Even nylon is predominately going into women's hosiery. Vinyl resin and vinylidene chloride are most widely used for industrial purposes, such as filter cloths, screens, and the like. This specialization, which is to be expected when a material is first put into commercial production, will not necessarily be permanent, and vigorous efforts will be made to expand their fields of usefulness. Eventually, however, each material must find its place in the whole textile family, just as cotton, wool, linen, and silk have in the past—a place determined by its deficiencies as well as its advantages, and most of all by its price.

All of the new synthetic fibers are now high in price compared with rayon, and this price can only be greatly reduced, as it was in the case of rayon by an increased volume of consumption. At present there is no indication that the growth of rayon consumption is being seriously affected by competition from these materials.

CELLULOSE AS A CHEMICAL INDUSTRY

Much greater progress in the complete utilization of the chemical constituents of wood has been made in Europe than in the U. S. One reason for this is that with fewer natural resources there is not as much competition, and it is economically profitable to market by-products, even those entailing a higher degree of purification.

Formerly the destructive distillation of wood was an important chemical industry in the U. S., not only for the production of charcoal but for the methyl alcohol, acetic acid, and other minor distillation products. Cheaper synthetic sources of methyl alcohol and acetic acid have so disrupted the market since 1925 that wood distillation is now of minor importance, surviving only by good management and adaptability to changed conditions. However, with sufficient profit incentive there is no technological reason why chemical decomposition of wood by modern distillation methods could not become a flourishing and efficient industry, capable of utilizing many kinds of wood that are now largely going to waste.

The spent cooking liquor of the sulfite pulping process contains sugars which can be converted by fermentation to ethyl alcohol. Practically all of the important European sulfite pulp mills manufacture ethyl alcohol, and it is also produced in Canada. The U. S. Government built a sulfite waste liquor alcohol plant at Bellingham, Washington, as a wartime measure. It is now being operated by a private company, producing about 6000 gallons of ethyl alcohol per day from a 335-ton sulfite mill. Under normal conditions, any such alcohol plants would meet with strong competition from those producing it from blackstrap molasses and waste petroleum gases, and this fact no doubt has discouraged other sulfite mills from entering the field, when full construction costs would have to be borne.

Another by-product which has been extensively developed in the Northern European countries is tall oil, which receives its name from the Swedish word for pine. It is made up of resin and fatty acids (along with some unsaponifiable matter) extracted from the wood and recoverable as skimmings from the spent black liquor in the alkaline pulping processes at the rate of 70 to 90 lbs. per ton of pulp. It serves as a substitute for vegetable and animal oils in soaps, paints, varnishes and driers, metal-cutting compounds, flotation agents, and many other products. The sulfate pulping industry is now recovering a large proportion of its tall oil and finds a ready market for it, although it is not being fractionated and purified to the extent that is profitable in Sweden. A domestic production of about 130,000 tons is estimated for 1947.

Another extractive by-product of the sulfate pulping process is sulfate turpentine; in 1945-46, it amounted to 22.5 per cent of the total turpentine produced in this country.

The most abundant by-product of the wood pulp industry is lignin, which is obtained in solution in the spent cooking liquors. In the alkaline processes the liquor is concentrated and burned to recover the pulping base, and some fuel value is recovered. In the sulfite process the liquor is generally run to waste. Extensive research has been and is being carried on to develop methods for obtaining salable products from sulfite waste liquor. Conversion from the usual calcium bisulfite to a magnesium or ammonium base cooking liquor would greatly simplify the recovery, although this would be a costly change in an established industry. One very promising development uses the sugar content of the liquor to grow yeast as a source of fodder, or even for human consumption. Another chemical product obtained from the waste liquor is vanillin, used in vanilla flavoring. Many other fine chemicals can be obtained but these, of course, have a limited market. Recovered lignin finds application in such varied uses as road building materials, binders for cement, a fertilizer base and soil conditioner, tanning assistants, water softeners, printing ink ingredients, and thermosetting plastics. The output of the wood pulp industry is so great, however, that much more lignin is potentially available than is required by any or all of the present uses.

It is evident that the United States cellulose industry as a whole is not a fully coordinated chemical industry, but progress is being made; and as the cost of pulpwood and the necessity for using less desirable species of wood increases, there will be more and more incentive for making this progress.

[5] Source of data: Rayon Organon, June, 1947.

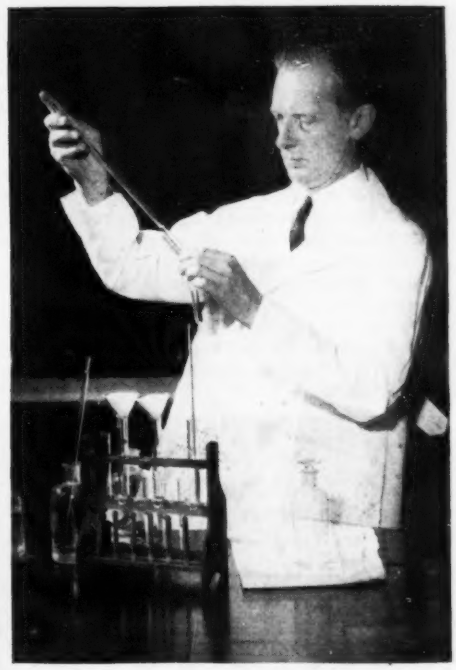
THE CHEMICAL PANORAMA

NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE

John A. Hill, elected president of Air Reduction Co., Inc. He succeeds C. S. Munson.

Robert F. Ruthruff, now engaged in consulting work, specializing in chemical patents.



Carl F. Cori, winner of the 1948 Willard Gibbs Medal, A.C.S., for research on sugar and energy.

Lawrence W. Bass, appointed vice-president of U. S. Industrial Chemicals, Inc. He will continue as the company's director of research and development, which he has been since 1944.

Aaron Addelston who has been made director of the Special Chemicals Division of Winthrop-Stearns, Inc.

Charles L. Westenberg, named executive vice-president of the Millmaster Chemical Export Corp., newly affiliated with Millmaster Chemical Co., to handle all exports.

Fiberglas acoustical board being laid between light troffers. The board provides a sound-absorbent ceiling with good light reflection.

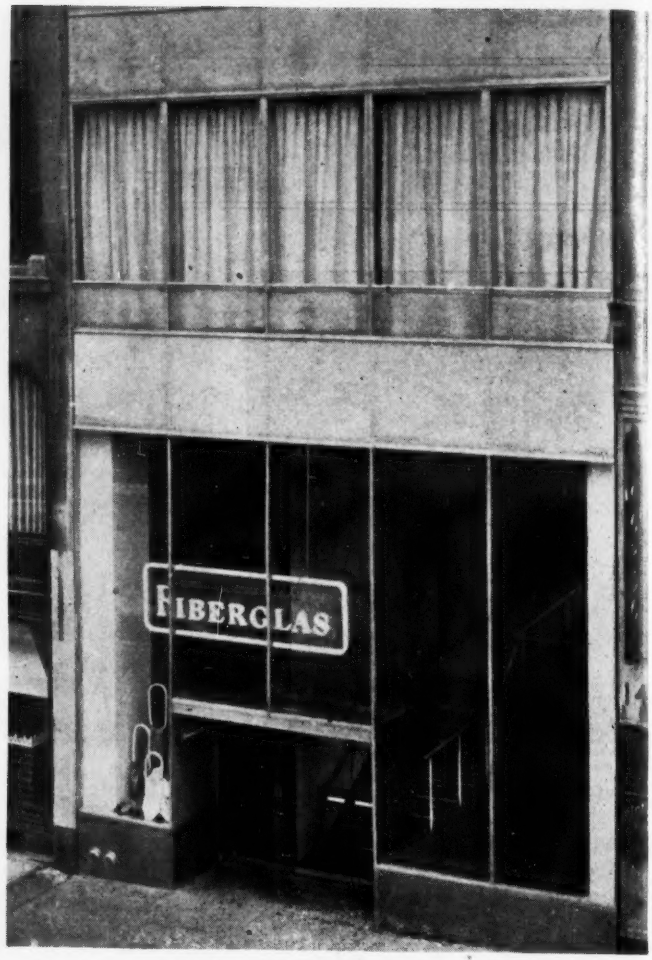
Fiberglas Building

Recently opened, the Owens-Corning Fiberglas Building, 16 East 56th Street, New York City, demonstrates uses of more than a score of Fiberglas materials, ranging from air filters and acoustical blankets to draperies and upholstery fabrics. The walls, and ceilings are all insulated with Fiberglas to show how it can be employed in industrial plants to help improve acoustics and cut down unnecessary noise. Also, the sound absorbing blankets used are fire resistant.

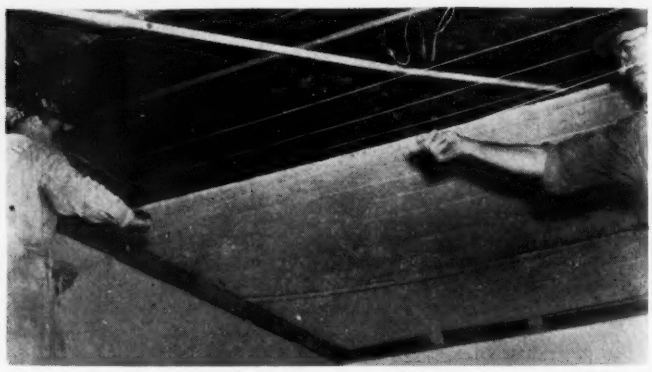
A variety of Fiberglas yarns have been woven into curtain materials and upholstery fabrics. These are made up in different weaves and colors and are waterproof. The company expects that these light weight textiles will be widely used in the future.

Insulation is installed on all air ducts leading from the central air conditioning unit, and these are equipped with Fiberglas air filters.

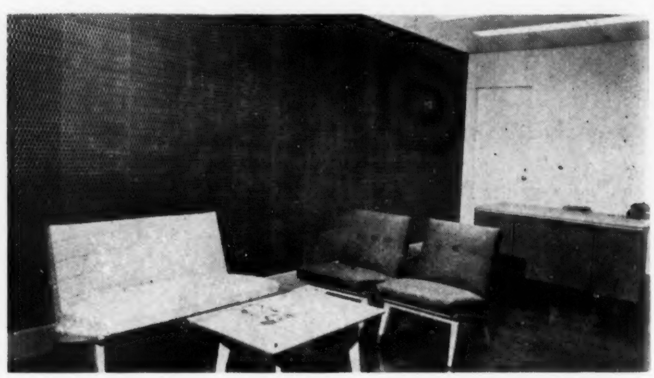
For better sound absorption, batts are placed between furring strips on walls, covered with porous mats and perforated aluminum sheets.



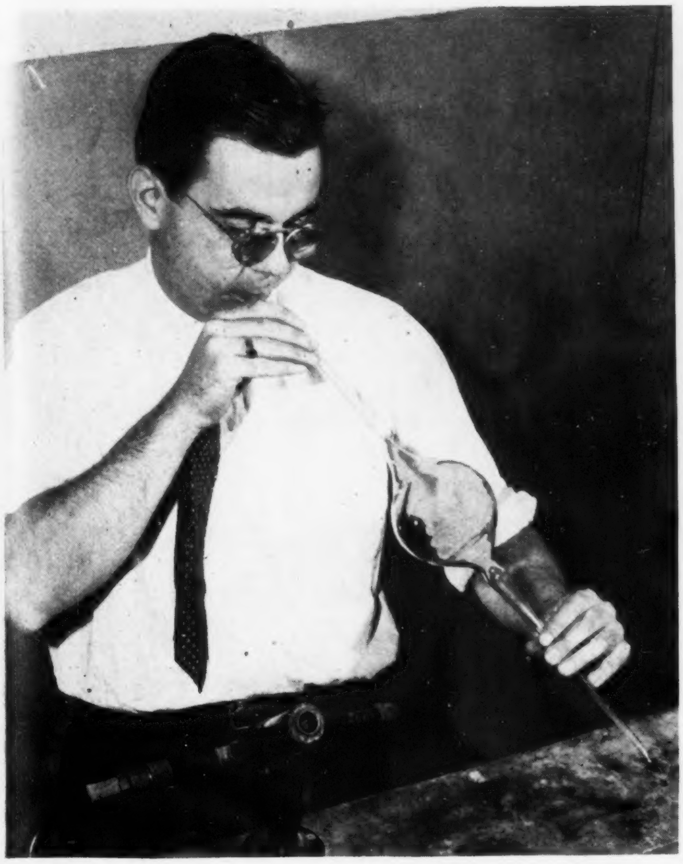
Front entrance of the New York Fiberglas Building. The building serves as a demonstration of numerous applications of glass in fiber form.



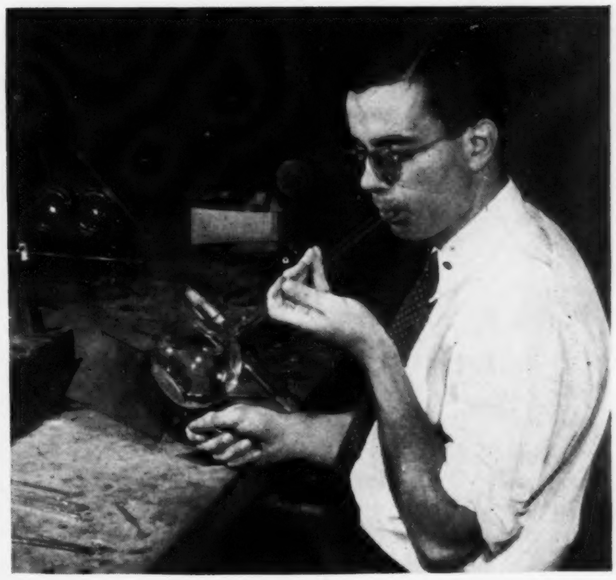
Fiberglas cord is stretched from wall to wall and then acoustical blankets are laid on cord to make a noncombustible acoustical ceiling.



Reception room on the fourth floor. The chair coverings of plastic film-covered Fiberglas yarns are water resistant and may be washed.



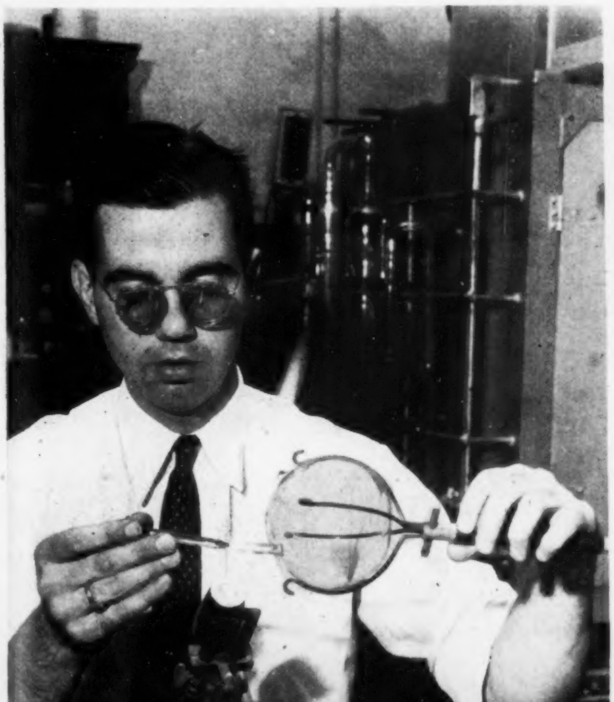
Harry Wier makes a two inch cylinder into a wash bottle. Heat seals one end, softens the center. Rotation accompanies blowing.



The soft glass is flattened for the base of the flask. Continued blowing molds the shape.

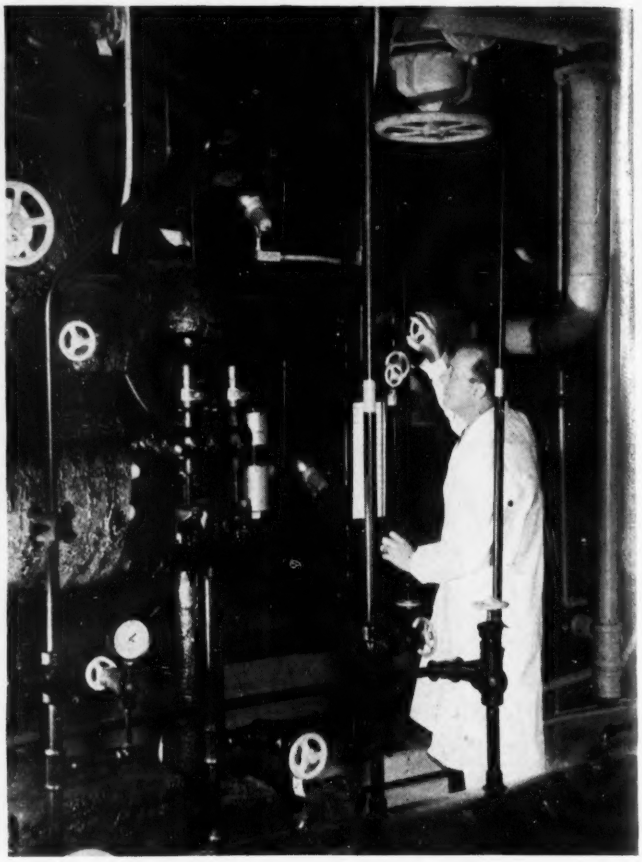
Chemistry's Craftsman

At the glass shop of du Pont's Experimental Station near Wilmington, the ancient art of the glass blower makes an essential contribution to the field of chemical research. Fabrication of laboratory equipment to novel designs, as required by chemists for solving basic problems of pioneering research, challenges the skill and originality of the glass blower when he is not meeting the demand for conventional supplies. Mastery of the art requires years of apprenticeship and a technical background in physical principles.



A rod is attached and cut off to form a stem to hold one end of a suction bulb to be added later.

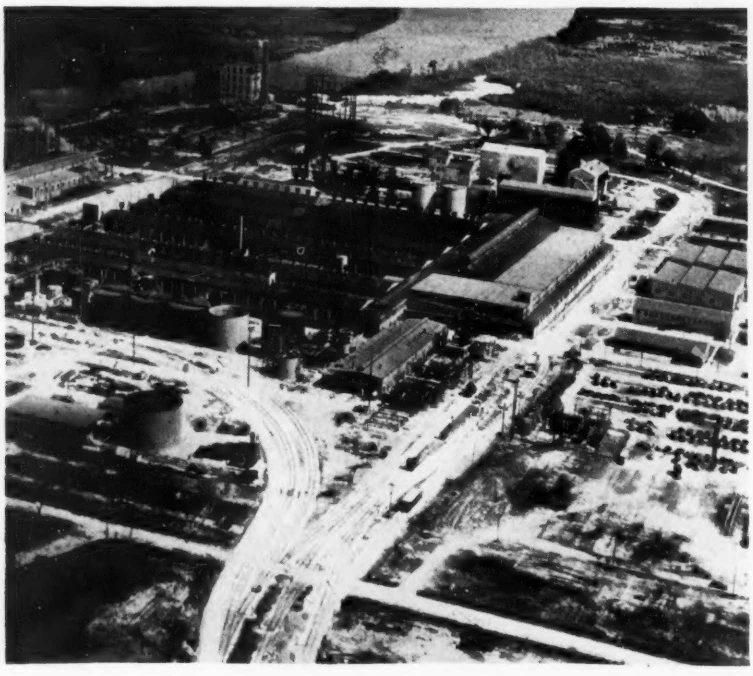
Neck and spout assembly will be sealed to the shoulder which is now just a bubble. Note safety spectacles worn at work.

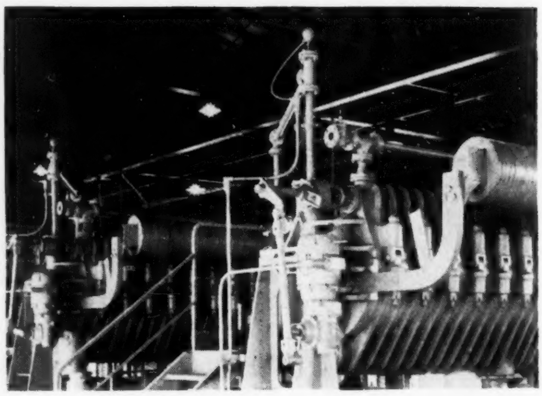


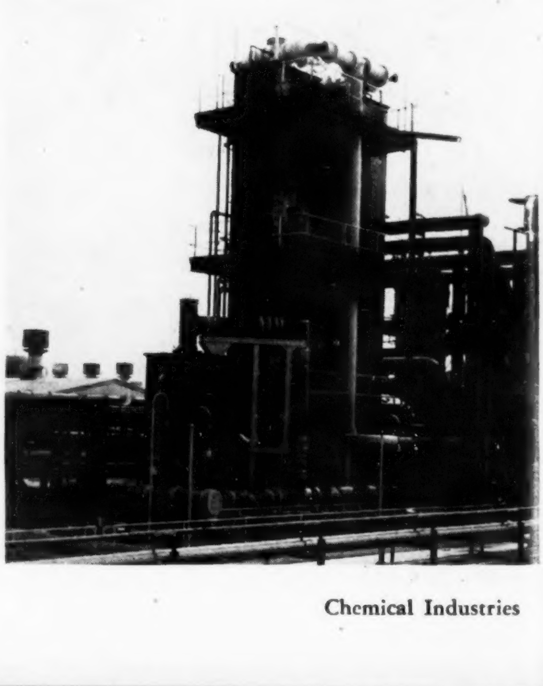
New Lyophile Plant

Sharp & Dohme has opened modern drying and condensing units at its biological laboratories, Philadelphia, to meet an increased demand for lyophilized products. The lyophile process is a method of dehydration used in the drug industry to preserve the stability of biological and sterile pharmaceutical products unstable in liquid form, and has also been successfully applied to dry citrus fruit juices and other food products.

The equipment at the new unit includes a battery of fourteen drying chambers and seven condensers, and more installations are planned.







Southern Caustic

Southern Alkali Corporation's liquid chlorine and caustic soda producing plant at Lake Charles, Louisiana, recently reached capacity production. About 40 per cent of the unit's output will be shipped by barge directly to consumer plants on the Mississippi River and on the Gulf Intercoastal canal system. The plant is only 50 miles from the entrance to the Gulf of Mexico, so Western Florida cities can be reached.

Above is an aerial view of the plant. At the upper right is purification equipment for caustic soda manufacture, and at the lower right is chlorine cooling and purification equipment.

In the treating of metal for corrosion resistance, phosphoric acid and other specially developed compounds are widely used by manufacturers of automobiles, telephones, washing machines, water heaters, stoves, etc. Solutions containing Victor* Phosphoric Acid form effective, rust-retarding phosphate coatings on iron and steel surfaces, and provide a more perfect bond between the paint and metal.

A Helping Hand for METAL TREATING

Victor chemicals used in metal treating, cleaning, plating, polishing and the manufacture of alloys include:

Ferrophosphorus . . . manufacture of special steels and foundry iron.

Oxalic Acid . . . cleaning railroad cars, brass polish, rust-proofing

Phosphoric Acid . . . metal cleaning compounds, rust-proofing, railroad car cleaning, electro-polishing.

Sodium Phosphates . . . cleaning compounds, tin plating, degreasing.

Wetting Agents . . . accelerate action of cleaning compounds.

Hemisodium Phosphate . . . contact tinning of brass.

Phosphorus . . . manufacture of phosphor-copper.

Sodium Acid Pyrophosphate . . . contact tinning.

Sodium Formate . . . plating baths.

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NEW PRODUCTS & PROCESSES

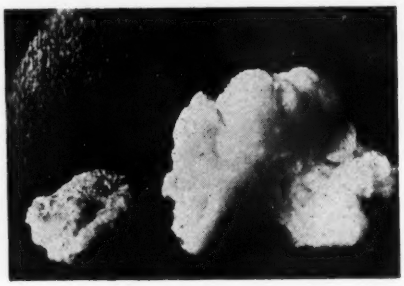
Expanded Aggregates NP 621

Perlite is a mineral (75% silica) of volcanic origin, containing entrapped water. When crushed and sized, the ore is expanded at controlled high temperature. It softens and the water expands to steam. The steam causes the mineral to pop like popcorn. Tempering plates each particle with a tough vitrified waterproof surface. The result is a series of lightweight, pure white aggregates containing millions of air cells under partial vacuum, weighing about $\frac{1}{10}$ as much as sand and gravel. The illustration shows the ore before (left) and after expansion. Weights of the different sizes of PerAlex (trade name) aggregate range from 7 to 15 pounds per cubic foot.

The larger sizes are used to replace sand and gravel in blocks, bricks, load-bearing walls, and masonry, where strength and insulation are required. It is claimed that such load-bearing masonry, when made with PerAlex, has approximately 10 times the insulating value of the same mix of sand and gravel.

The smaller sizes are lighter in weight and are used for insulated fire-proof roof decks, sound deadening fire-proof plaster and various end products. With standard cement used as a binder for masonry and roof decks and gypsum the binders for plaster, and PerAlex replacing sand or gravel, (without changing A. S. T. M. standard sizes) the (plaster and concrete) end products in place show a weight reduction of about $\frac{2}{3}$. All end products are nailable and sawable. PerAlex is available from AleXite Engineering Division of Alexander Film Co.

Several perlite expanders produce an excess of cyclone fines for which there is no ready market. A product known as SurfaSeal is one of several which has been developed to utilize fines. It is an efficient, inexpensive, decorative brush-on paint or stucco for all masonry surfaces.



It seals the pores and is so water repellent that it is used for stopping certain basement leaks. It is made from perlite fines and standard cement. The AleXite Engineering Division supplies the formula and water repellant chemicals to its ore customers.

Non-Toxic Insecticides NP 622

A new and safe insecticide material is in production and insecticides made from it are now available to the consumer in quantity, from U. S. Industrial Chemicals, Inc.

Known as Pyrenone, the new insecticide can be used with complete freedom where food is handled. After three years of exhaustive tests, it has been found effective against a broad range of insect life.

The new insecticide can be used in oil sprays, aerosols, emulsions, dusts or wettable powders.

It can be sprayed on the interiors of grain bins, where insects have been taking an annual toll of 300,000,000 bushels of grain in the United States alone, or three times the 100,000,000 bushels needed for the relief of Europe. It can be used safely on growing foods, feeds of animals, or anywhere that food is processed or prepared for human consumption. It has complete safety in household or garden use, and can be used directly on animals, without damaging effect to animals or to meat and dairy products.

Pyrenone is used to designate a wide group of insecticide concentrates obtained by combining either piperonyl cyclonene or piperonyl butoxide with pyrethrum.

Piperonyl cyclonene and piperonyl butoxide which are laboratory developments or synthetics, are both effective as insecticides when used by themselves. When used with the pyrethrins obtained from pyrethrum, however, they combine their own killing power with the terrific knockdown power of pyrethrum.

Generally speaking, the Pyrenones containing piperonyl cyclonene will find most use on growing crops, either as sprays or dusts, while the butoxide combinations will have their widest use in the protection of stored grains, in food plants, on animals and in the household.

Under controlled conditions, Pyrenone will render a 98 per cent kill of houseflies within 10 minutes.

The effect on mosquitoes, biting gnats and black flies is almost instantaneous.

Used in any form, the insecticide appears not to be absorbed by the skin and does not injure animal tissues. Tests have shown that even if animals or poultry take the insecticide orally, either by accident or design, they suffer no ill effects, regardless of the quantities swallowed.

Vinyl Resin Aqueous Dispersion NP 623

A new vinyl coating is available from the Amercoat Division of the American Pipe and Construction Co. Called Amercoat No. 88, it is a pigmented vinyl resin dispersed in water. It has no unpleasant odor either during or after application.

No. 88 will resist most dilute acids and is unaffected by alkaline cleaning compounds normally employed as detergents. It resists all aliphatic alcohols and most aliphatic petroleum hydrocarbons. It is waterproof and weatherproof and is unaffected by continuous exposure to all animal and vegetable oils. It will not support growth of bacteria, mold or fungi. In the past, the solids content of conventional vinyl coatings necessitated multiple coats to obtain adequate film thickness. The high solids content of Amercoat No. 88 produces a thicker film with fewer coats to give greater coverage and better sealing action.

Any painter can apply No. 88 successfully with a brush or spray gun. It air dries quickly without baking. Amercoat No. 88 does not sag or run on vertical

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Please send me more information, if available, on the following items. I understand that nothing further may be available on some of them.

NP 21	NP 25	NP 29	NP 33
NP 22	NP 26	NP 30	NP 34
NP 23	NP 27	NP 31	NP 35
NP 24	NP 28	NP 32	NP 36

(Please print)

Name .... (Position) ....

Company ....

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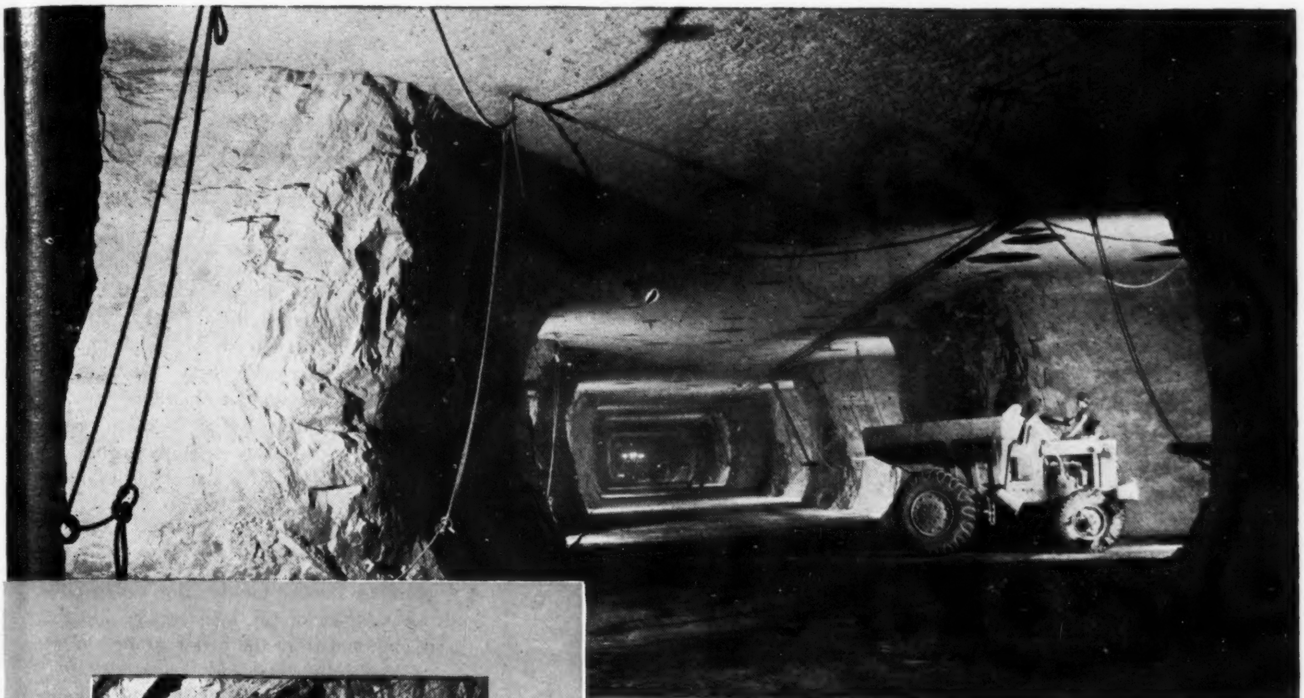
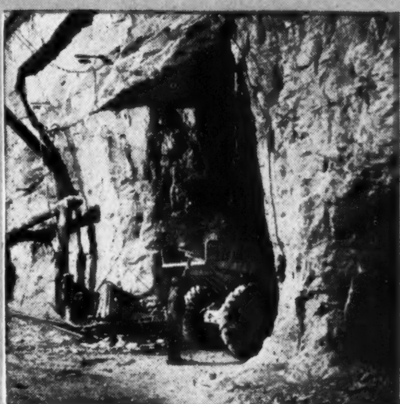




walls, and levels well. It can be applied over concrete, masonry or wood surfaces and will not soften or lift old paint. It is available in white, solid colors and selected pastel shades, and has excellent hiding power.

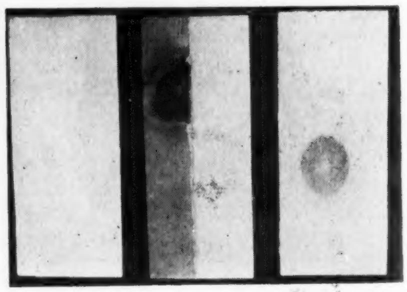
Toxaphene Insecticide Emulsifier NP 624

Extremely stable water emulsions of toxaphene can be made with Emcol H-30 Emulsifier developed by the Emulsol Corp. A concentrate of the toxaphene and emulsifier are first produced by means of various formulations provided in technical literature. These are readily miscible with waters of any hardness.

Lumber Knot Sealer NP 625

It is now possible to make use of economy lumber for exterior siding without sacrifice of the long service life that is expected from the better grade. Wider utilization of this lower cost lumber is made possible through the use of Bakelite and Vinylite resins.

Economy lumber is characterized by the large number of "live" knots which



it contains. Though these knots are intergrown with the surrounding wood fibers and never loosen, they exude pitch and volatile substances that destroy the paint film covering them long before the clear portion of the wood needs repainting. Bakelite and Vinylite plastics in the formulation of a superior sealer for these knots has resulted in a wider use of economy grades with assurance that they will not require frequent repainting.

The Western Pine Association after conducting extensive research to solve the problem of sealing these knots, now recommends a formulation containing Bakelite and Vinylite resins which outperformed other sealers and methods.

In the manufacture of this sealer, Vinylite vinyl butyral resin is dissolved in alcohol and to this solution a Bakelite phenolic resin is added. No other solvents or pigments are added.

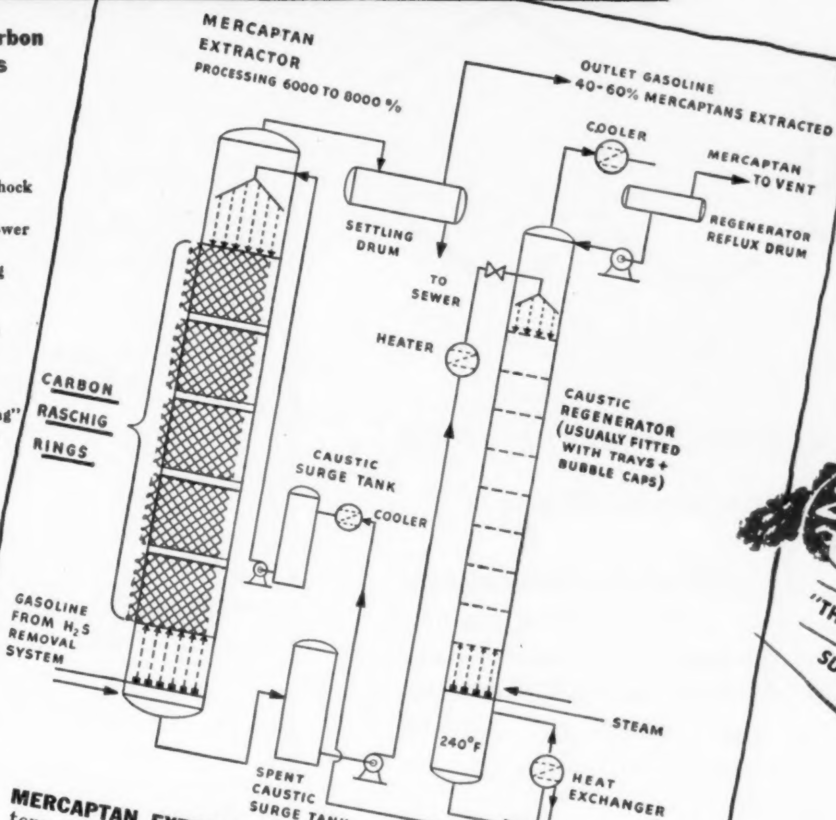
In application, the sealer is brushed over the unprimed knots and the surrounding area. The coats of paint are then applied in the usual manner. For repainting, all old paint is scraped from knots or pitchy sections and they are coated with the sealer before application of the paint.

An effective knot sealer must deposit a film over the knot which will remain

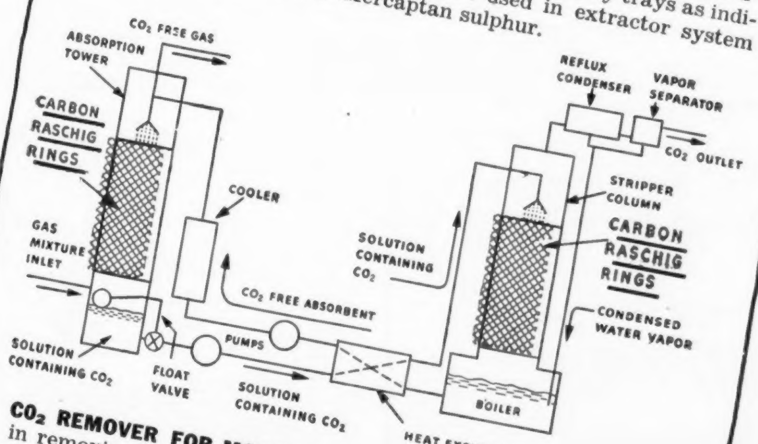
Pack your towers...with CARBON Raschig Rings!

Advantages of Carbon Raschig Rings

- Corrosion resistant
- Light in weight
- Immune to thermal shock
- Won't crush in the tower
- Minimum of chipping and spalling
- More contact surface
- Low back pressure
- Eliminate "channeling" of flow material



MERCAPTAN EXTRACTOR—Typical Mercaptan extraction system used in oil refineries. Extractor is usually packed with 1" diameter Carbon Raschig Rings, either solid or by trays as indicated. 10% to 20% NaOH solution used in extractor system removing up to 60% of Mercaptan sulphur.



CO_2 REMOVER FOR MONOGAS—Typical extraction system used in removing CO_2 from Monogas. Both towers are packed with 1" diameter Carbon Raschig Rings for maximum contact surface, absence of "channeling," and minimum back pressure. Carbon Raschig Rings are suitable to a wide range of tower-packing jobs.

"National" "Kempruf" Carbon Raschig Rings provide the most economical and efficient tower-packing material for reaction and scrubbing towers handling corrosive agents, such as hydrofluoric acid, organic-hydrochloric mixtures, and hot aqueous alkalies. These rings are also excellent in extraction systems . . . towers in which sudden temperature changes result in severe thermal shocks . . . rectifying towers . . . and tower processes where thorough dispersion is essential to satisfactory operation.

For more information, write to:
NATIONAL CARBON COMPANY, INC., Dept.

The terms "National" and "Kempruf" are registered trade-marks of
NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

impervious to the extract from the knot, yet it must not penetrate too far into the exposed end-grain and cause "flatting" of the subsequent film. It must adhere firmly and be receptive to the application of paint so that the paint itself will not peel or break away. The sealer maintains these requirements under all weathering conditions.

Shampoo from Coffee NP 626

A new use for coffee has been developed by Coffette Products, Inc. A hair shampoo is now being produced, and other products in the cosmetics, toiletries, pharmaceuticals, detergents and food fields will be introduced later in 1948, all developed from coffee.

Coffette Shampoo is processed principally from sub-standard and other coffee which cannot be used for beverage purposes and which would ordinarily be destroyed or wasted. Specifically, 50 per cent of all the coffee grown annually never reaches the commerçial markets but is discarded as sub-standard. The production of shampoo and other utilitarian products from coffee has never been successfully achieved before, although the Brazilian government has been interested in experimentation for the past 25 years.

It is the oils, glycerized products, and tannic acid in the coffee bean that give Coffette shampoo its unique qualities. These nature-produced raw materials, with no alcohol or harsh chemicals added, produce an antiseptic shampoo.

Rubber Stock NP 627

Fel-Pro 131 is the name of a new synthetic rubber material developed by the Felt Products Manufacturing Co..

Reports of laboratory tests conducted by the company and verified by an independent testing laboratory are summarized as follows: 1,800 p.s.i tensile strength; 400% plus ultimate elongation; 2% maximum swell in A. S. T. M. fuels and oils; high temperature resistance (300°F—hot oil); flexibility retained with no cracking at —55°F; resistance to abrasion and no surface deterioration on aging; and a Durometer hardness (Shore "A" type) up to 80 plus or minus 5.

Special manufacturing techniques have enabled the company to bring the cost of this product into the lower-price level of other synthetic stocks. Fel-Pro 131 should prove to have unlimited uses for original equipment manufacturers of such products as automobile engine and chassis parts, pumps, freezers and refrigerators, high compression flanges, and many other items.

Performance tests have shown that Fel-Pro 131 has some new and exceptionally useful physical properties, such as its high tensile strength and low compression set after extensive immersion in various fuels, oils and solvents.

It remains in excellent condition through a wide temperature range. This new stock can be furnished in the specified hardness of stock required, and it can be cut, molded or extruded to suit the individual application.

Chlordane Insecticide Emulsifier NP 628

A new low cost emulsifier for chlordane, known as Emcol H-65, has been developed by the Emulsol Corp.

Water miscible concentrates are easily made by mixing one part chlordane with one part Emcol H-65 or by mixing 50 per cent chlordane with 20 per cent Emcol H-65 and 30 per cent deodorized kerosene. 10 per cent or 2 per cent chlordane water emulsions are quite stable from either type of concentrate.

Phenolic Molding Powders NP 629

The General Electric Chemical Department is now marketing a complete line of phenolic molding powders. Designed to satisfy a major portion of the needs of the average molder, the new line includes general purpose, high heat resistant, and impact resistant plastic materials.

Available in standard colors and mottles, the G-E phenolic molding powders exhibit a high quality and uniformity maintained by a series of critical tests made on every batch of material prior to shipment. Tests include specific gravity, tensile strength, dielectric strength, flow, powder pourability, shrinkage, and Izod impact.

The molding materials provide excellent finishes and high glosses and are available in a flow range of soft, medium-soft, medium-hard, and hard. Applications range from distributor caps and switch bases to radio cabinets and cooker handles.

Anti-Skinning Agent NP 630

A new product finding application in the paint industry is Orbis Anti-Skinning Agent, made by Orbis Products Corp.

It is a liquid and is readily miscible with mineral spirits and other common thinners used in the paint field.

Tests have been made on outdoor enamel, synthetic equipment eggshell enamel and semi-gloss paint (medium oil alkyd type).

Orbis Anti-Skinning Agent is moderately priced, according to the company, and is available in 25 and 50 pound cans and 400 pound drums.

Modified Beeswax NP 631

International Wax Refining Corp. has introduced a modified and stabilized beeswax which is said to stop batch losses and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NEW HORIZONS...
With their long-range "telescopes" of chemistry and research, industry is forever probing into distance and the future—scanning new horizons for objectives hitherto considered impossible to attain.
Perhaps these lenses of science are seeking a newer and better plastic—a tougher kind of metal or more potent insecticide—a more exotic perfume or an "antidote" against germ warfare.....
Heyden chemicals have always played a major role in these unpredictable developments. They will continue to anticipate the demands for finer chemicals by the process industries and their tireless research laboratories.
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Parahydroxybenzoates • Penicillin • Pentaerythritols • Salicylates

allow the production of uniform quality formulations.

Ordinarily, the company states, bleached crude beeswax varies over the whole U.S.P. range of acid number, melting point, saponification value, and other analytical constants. Such variation causes production difficulties, particularly in emulsification and in the manufacture of soft, smooth cold creams, but the stabilized product enables formulation of a uniform product.

New Lanolin NP 632

Hychol is the brand name of a new type lanolin with a cholesterol content of 20 per cent. This compares with the standard grades which contain a maximum of only 13 to 15½ per cent.

It resembles other lanolins in physical appearance and has the same general chemical structure. The high cholesterol content of this product makes it particularly suitable for use in special cosmetic compositions.

The melting point of practically all USP lanolins lies within the range 36 to 40° C, whereas that of Hychol averages between 43 to 45° C. It has a comparatively hard, waxy body. This makes it particularly useful for increasing viscosity and emulsion stability of cosmetic creams and lotions. The emulsifying power of Hychol is approximately 25 to 30 per cent greater than that of the average cosmetic grade of lanolin. The emulsions which it forms are of the water-in-oil type.

Hychol, because of its waxy nature, should give better results in such products as lipsticks, paste rouges, eyebrow pencils, and mascaras, where the use of the standard grade of lanolin is somewhat limited, because of the tendency to soften such products when incorporated in fairly large proportions.

Some interesting and unusual uses have been suggested for Hychol outside the cosmetic and pharmaceutical fields. For example, it has been found very effective in printing inks as a non-crystallizing compound in conjunction with beeswax. It is also somewhat more effective as a plasticizer in adhesives. Hychol is now being used in the formulating of ski waxes and to some extent, in the manufacture of special marking crayons. It fs available from Robinson, Wagner Co., Inc.

Resin Emulsions For Leather NP 633

Two new resin emulsions designed for the leather finishing industry have been developed by the General Electric Company's Chemical Department.

The new emulsions, designated R301-5 and R301-6, contain a tough flexible resin which on evaporation yields a clear, colorless film that is exceptionally low in water absorption. Film flexibility is obtained without the use ot plasticizers; therefore there is no tendency for the

emulsion film to harden as a result of evaporation or migration of the plasticizer into the leather.

The R301-5 resin emulsion contains a soft, tacky resin possessing excellent pigment binding properties. It is especially recommended as a clear sealer coat for leather splits or as a binder in pigmented covering coats. The addition of this emulsion to water solutions of conventional finishing materials such as casein, albumin, and shellac permit many treating modifications.

The G-E R301-6 emulsion contains a non-tacky modification of the film-forming resin and is recommended as a clear finish for fine side leathers where pigment binding is not of prime importance.

Quaternary Ammonium Salt Tablets NP 634

A quaternary ammonium sanitizing agent can now be obtained in an easy-to-use tablet form.

Amerse tablets, developed by Vestal Laboratories, Inc., contain 30% active quaternary ammonium salt in an inert, non-toxic filler and are scientifically controlled to give 150 ppm. active ingredients in 2½ gallons of water. One tablet in 2 gallons of water will produce 200 ppm active ingredients.

The tablets offer an opportunity to sanitize eating and drinking utensils and food processing equipment in restaurants, fountains, taverns, dairies and other food plants in a most efficient manner. They eliminate measuring and waste—there is no spillage, freezing or extra work—just drop in a tablet and in a few seconds the sanitizing solution is ready for use.

Disintegrating in less than 1 minute after immersion, the tablets dissolve completely in 2 to 3 minutes. Dissolution time can be accelerated by agitation

Water Soluble Oils NP 635

A recent development that has been translated to commercial production now makes available in commercial quantities a number of chemical esters, of an oily character, that dissolve in water.

Chemically, these products are polyoxyethylene oleates and laurates having a molecular weight above 800. They are non-ionic, non-toxic, light in color and fluid or grease-like in consistency. They dissolve clearly in water, alcohol, esters, hydrocarbons and vegetable oils. At 20°C they are slightly heavier than water. They all have high boiling points and exhibit surface-active properties.

The above properties indicate their use as special detergents in textile and fiber processing; as penetrating lubricants; grinding media for pigments; plasticers for water dispersed products and water-insoluble resins, elastomers, plastics, coatings, and emulsifying agents for oils and hydrocarbons.

They are produced and sold under the

names Polyethylene Glycol Mono Oleates (S1005) and (S1010) and Polyethylene Glycol Mono Laurate (S1019) by the Glyco Products Co., Inc.

Alkanolamine Condensate Wetting Agent NP 636

A new non-ionic wetting agent, Emcol 5100, has been developed by the Emulsol Corp., in its line of surface-active agents. This product is of the alkanolamine condensate type, light in color, clear, and has viscosity modifying effects, showing good wetting and detergency as well as rinsing properties.

Emcol 5100 is compatible with both anion and cation active detergents and usable in mildly acid or alkaline ranges.

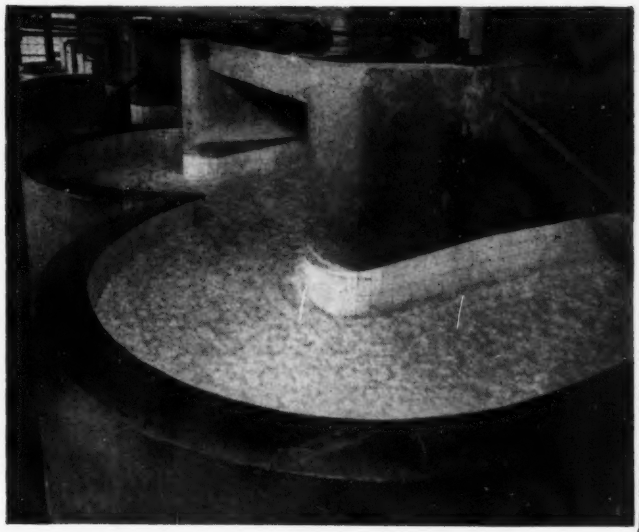
Polyacrylic Ester Withstands Heat NP 637

A new type polyacrylic ester rubber that can be compounded and vulcanized in a wide range of soft to hard compositions is being made by B. F. Goodrich Chemical Company. Known as Hycar P.A. it is technically identified as a polyacrylic ester and is an elastomeric material resembling natural, pale crepe rubber in appearance. The vulcanized forms exhibit outstanding resistance to heat, oils, ultraviolet light, ozone and gas diffusion, and non-rigid compounds show extremely good flexing life. Compounding, molding, extruding, calendering and curing operations are readily accomplished with standard rubber processing equipment.

Available in both dry and latex forms, Hycar P.A. in the unvulcanized state may be utilized as an adhesive and as a coating or impregnant for fabrics and papers. Vulcanized products have shown outstanding performance as heat-resistant coatings on fabrics, heat and oil-resistant gaskets, hose, belting, oil seals and other mechanical applications. As an insulation coating on electric motor coils, and as a heat and oil-resistant jacket for wire, polyacrylic ester shows promise of extending the usefulness of electrical products.

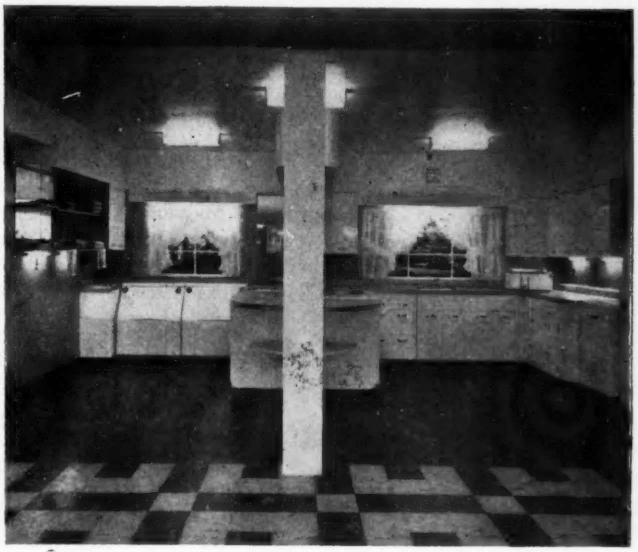
Patents covering processes of vulcanization have been issued to the company and will be made available to licensees. These processes make possible the manufacture of rubber products that will withstand operating temperatures considerably above those of conventional rubbers. When tested under an electric iron at 400° F for 8 hours, the new material showed no apparent loss in properties, whereas older type rubber compounds were completely deteriorated in a much shorter time. After 720 hours at 300° F, the polyacrylic ester shows a change in elongation of only 35 per cent in comparison with 75 per cent in 7 hours for good rubber compounds. Ozone resistance is even more striking, 600 hours exposure showing less effect on the new material than 6 seconds on rubber.

HOW CAN ISCO PRODUCTS WORK FOR YOU?



CHLORIDE OF LIME—$CaCl(ClO).4H_2O$. 35-37% Active Chlorine. Has many uses in sanitation, public health and industry. Used for bleaching and processing paper, textiles. Used in laundry bleaching. Used wherever sterilization is a problem such as water, dairies, etc. Used in manufacture of textiles, pulp, paper, chemicals, etc.

in the Chemical and Allied Industries



SODIUM SILICOFLUORIDE—Na_2SiF_6.
White, odorless, amorphous powder. Used in manufacture of enamels, ceramic glazes, opal glass, artificial marble; ingredient of insecticides; laundry scouring agent; in medicine.

TALC—all cosmetic grades of the finest talc available. You benefit from wartime research when you specify Isco Talc. We have retained the same methods of production developed during the war to provide chemically standardized talc of definite particle size and shape.

You'll like ISCOoperation!

When you call on Isco you can be sure of cooperation from the moment you make your inquiry. You'll like ISCOoperation whether it's a problem of replenishing inventories or a problem of the right material for a new product or process. Our technical department will help you solve any problem involving the use of an Isco product.

In addition to the above products we have available for immediate delivery the following: Kaolin for Cosmetics (Isco Excel Imported Bolted), Isco China White Clay (for the leather industry), Orthodichlorobenzene, Paradichlorobenzene, Naphthalene,Gum Ghatti, Gum Arabic, Gum Karaya, Gum Tragacanth, Sodium Orthosilicate, Tech. Anhyd., Sodium Metasilicate, Anhydrous, Formic Acid, Ammonium Carbonated (Lump & Powd.), Borax, Boric Acid, Carbon Tetrachloride, Magnesium Chloride, Flake, Potassium Chloride, USP & Tech., Carnauba Wax, Candelilla Wax, Montan Wax, Magnesite, Magnesium Oxide, Zinc Sulphate, Gran. 89% Anhydrous, Lanolin, Anhydrous, USP and Cosmetic. Silica, Pure, Soft, Decomposed & Pharmaceutical Grades.

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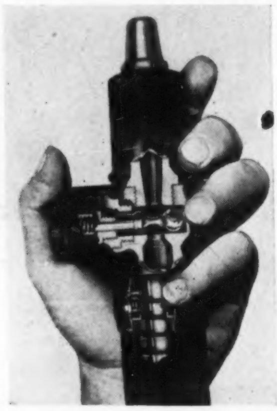
NEW EQUIPMENT

Palm-Size Hose Valve QB 449

A new palm-size, hose valve operates without springs and with only two moving parts—the operating plunger and the con-



trolling ball. It is produced by the Paul Valve Corp.

The hose nozzle is discharged by pushing a button, causing a plunger to roll the ball off its seat, giving instant full flow. at 50 psi hose pressure, less than 10-pounds finger pressure on the button opens the valve. Only 4 pounds of finger pressure are necessary to hold it open.

When the push button is released, the difference in pressure between the center and the outside of the stream forces the ball into the valve throat, closing the valve and raising the push button plunger. The ball is held firmly against the seat by line pressure, making a line-contact seal.

The valve is available for standard hose sizes from ¼ inch to 1 inch, delivering up to 13 gallons per minute at 75 psi. line pressure. It is made entirely of Monel, including the ball and the plunger, for maximum resistance to corrosion and wear. The body is rubber-coated so that there is no danger of scratching interior surfaces of tanks or other equipment being cleaned. In addition, one model is fitted with a threaded replaceable nozzle that adapts the valve for use with long extension nozzles.

Portable Radiation Meter QB 450

National Technical Laboratories has developed another portable radiation instrument. The Beckman Model MX-5 is a portable Geiger-Muller counter weighing only 9 pounds, for the detection and measurement of X, beta, and gamma radiations. It is ideal for the measurement of radioactivity of low intensity, such as locating isolated radioactivity leaks or lost

radioactive materials in factories and industrial applications. The instrument is completely waterproofed, and the case is desiccated.

The MX-5 Meter is battery operated, with the self quenching GM tube mounted on a 3′ probe. A selector switch gives three operating ranges, 20, 2 and 0.2 mr/hr. The MX-5's new type circuit eliminates zero control, features rapid meter response and extends battery life to 400 hours. An external control to compensate for changes in battery voltage and tube characteristics permits calibration under any operating condition.

Metering Pump QB 451

The Milton Roy Constametric pump will

1. Pump at constant controlled flow without pulsation.
2. Pump at constant controlled flow in very low capacities,—down to approximately 75 ml per hour as a maximum for an individual pump.

Constant flow is achieved by causing a plunger to move forward at a constant rate of speed. Two plungers in two displacement chambers are employed, with a common suction and common discharge connection. As one plunger nears the end of its stroke, its speed is slowed at a rate equal to the start forward speed of the second plunger so that the rate of total discharge volume remains a constant.

The capacity of the pump is fully adjustable while the pump is in operation, from a maximum to practically zero through an indicating hand micro adjustment. There will be no variation in capacity delivered with variation in discharge pressure.

Flexible Coupling QB 452

The only part that absorbs wear in the couplings of the American Flexible Coupling Co. is the center member or block which has a free sliding action between the two jaw flanges of the coupling. This

center member is faced with bearing strips which are the points of contact with the jaw flanges and was recently improved so that the bearing stips now slide upon the center block to which they are secured. This greatly reduces the friction which results between the bearing stips and the flanges as the coupling rotates.

In the American flexible coupling each of two jaw flanges, mounted on the shafts, engages opposite parallel surfaces of a square center member, the engaged surfaces of each being at right angles. The center member slides between the two integral jaws of each jaw flange in directions relatively at right angles as the whole coupling rotates, transmitting the torque.

Metal Weatherproofing QB 453

To simplify the long-term maintenance of other steel, Dum Dum for Metal was developed by the Arco Research Laboratories. Dum Dum for Metal provides a

Multiwall users call him

THE BEMIS QUIZ KID

When it's a question on packaging, he has the answer

The Bemis Packaging Specialist has many tough questions fired at him, but he comes back with the answers like a quiz kid.

For instance, variations of such questions as: How to get better closures, what is the best type of package for a particular job, how to save money in shipping, how to store and care for paper bags—these he takes in his stride. If necessary he comes right into your plant to seek out the answer.

This is a part of Bemis Packaging Service. It is available to all plants without obligation. Make use of it. Hundreds of companies save money right along because they've talked with the Bemis Packaging Specialist.

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durable coating many times the thickness of paint that makes the metal surface to which applied impervious to measurable vapor and moisture transmission.

It is economically applied by spray method for complete, uniform coverage and maximum protection of surfaces and may be used with minimum surface preparation on both new or uncoated metal structures and over previously coated surfaces. However, the material is not recommended for use over bituminous-type coatings. Substantial savings in maintenance are also claimed.

Motorized Wheelbarrow QB 454

A new wheelbarrow, the Power-cart, which carries a load three times the size of the conventional type, built on a chassis and motorized, has been developed by Gar-Bro Mfg. Co. The "Power-cart" is 81½" long, and the loading height is 31". It is powered by a 2½ hp. (minimum) gasoline engine.

It holds 1500 lbs. Traveling is easy because the forward and reverse gear, as well as the steering, is controlled with the same lever—a tiller. The "Power-cart" turns on a radius of 4'. Dumping is easy because the load is balanced in the tray and because the operator can be either standing or sitting. The tray is released with a foot-operated latch. A mechanical brake is also foot-operated. The pofer-unit is air-cooled and has a V-belt and chain drive. Transmission

is one forward and one reverse gear, clutch-type action; driving speeds are 6 to 8 mph. and are foot-throttle controlled.

Magnetic Pulley Separators QB 455

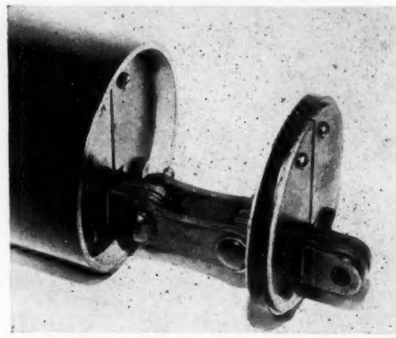
A complete line of self-contained horizontal and inclined magnetic pulley type separators incorporating an Alnico magnetic Perma-Pulley, idler pulley, endless belt and drive is now available from Dings Magnetic Separator Co.

These units provide completely automatic removal of tramp iron where either protection of machinery or purification of product is desired. They are intended for installation at the discharge of chutes, hoppers and conveyor belts.

Standard models are available with belts of any desired length in widths ranging from 12" to 60". Perma-Pulley diameters range from 12" to 30".

Conveyor Flights QB 456

Hapman Conveyors, Inc., presents their new synthetic rubber flights mounted on sealed pin chains. They will convey a wide variety of materials through a 3", 4", 6", 8", 10" pipe or semi-circular trough section. Having a circular cross section

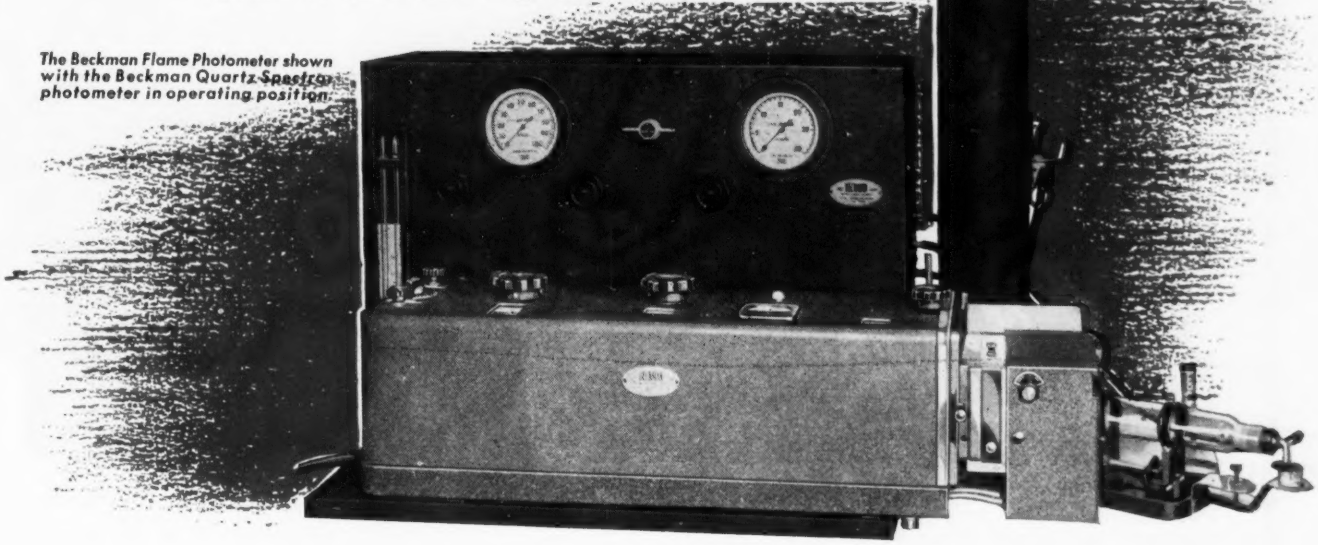


this flight wipes the pipe or trough clean. Although originally designed for use with Hapman Pneumatrols and to convey into and out of pressure zones this flight design has found use in many fields. It utilizes the standard Hapman sealed pin principle and can be used in abrasive handling applications. This design will follow a pipe in any direction.

Another Beckman development to simplify modern analytical problems...

The Beckman Flame Photometer

- **Quickly attached to Beckman Quartz Spectrophotometer**
- **Invaluable aid in wide range of today's control applications**



The Beckman Flame Photometer shown with the Beckman Quartz Spectrophotometer in operating position.

Leading scientific and industrial organizations have already discovered the many important savings in time and labor, the reduction in waste, and the greatly increased control efficiencies made possible by the Beckman Quartz Spectrophotometer...

NOW FROM the Beckman development laboratories comes another advancement that increases still further the wide-range versatility and adaptability of the Beckman Quartz Spectrophotometer to various analytical and control problems. It is the Beckman Flame Photometer — a compact easily-attached unit that simplifies both qualitative and quantitative analyses of a large number of chemical elements. Its use of a hot flame is an important advantage, for this feature permits excitation of the spectral lines of a larger number of elements, including many heavy metals and alkaline earths — whereas a "cool flame" instrument excites only those of the alkali metals.

MANY APPLICATIONS

The Beckman Flame Photometer is a valuable aid to a wide variety of analytical problems, including water analyses... metal and ore analyses... determination of inorganic traces and impurities in foods, chemicals, biologicals and pharmaceuticals, and in organic materials which can be reduced to inorganic solutions.

Only a small sample is required for a complete analysis and full advantage is taken of the high resolving power and photometric accuracy of the Beckman Spectrophotometer, permitting versatility and sensitivity greater than 0.01 p.p.m. This accuracy far exceeds that obtained with filter-type or other less sensitive instruments... and the hot-flame advantages already outlined further increase the wide range versatility and accuracy of the Beckman Flame Photometer. Write for full details on the many important savings this Beckman development makes possible in modern control applications. Beckman Instruments, National Technical Laboratories, South Pasadena 17, California.

A few of the many BECKMAN Flame Photometer Advantages

▶ **SIMPLE OPERATION:** Samples are atomized and introduced at a uniform rate into a very hot oxygen and gas flame through a specially designed burner. The spectral emission lines of the elements are excited and the Spectrophotometer isolates these lines and measures their intensities relative to a blank or standard.

▶ **RAPID ANALYSES:** Because samples are atomized directly from external beakers, samples can be analyzed very rapidly. A rate of four samples per minute is easily maintained — and re-checks against blanks can be quickly made at any time.

▶ **QUICK, DIRECT READINGS:** Results are instantly and directly readable on an accurately-calibrated dial. No photographic processes or densitometer comparisons are necessary.

▶ **MAXIMUM VERSATILITY:** Unlike "cool flame" instruments which excite the spectral lines of alkali metals only, the hot flame of the Beckman Flame Photometer excites those of many elements, including heavy metals and alkali earths. This advantage, coupled with the very high resolving power and photometric accuracy of the Beckman Quartz Spectrophotometer, permits the accurate analysis of an unusually wide range of elements.

▶ **FULL SPECTRAL RANGE:** Because of the wide spectral range of the Beckman Quartz Spectrophotometer, the Flame Photometer can be used in the ultraviolet, visible and near infrared spectral regions, insuring maximum range and adaptability.

▶ **ONLY SMALL SAMPLES REQUIRED:** Sample consumption rate is less than two-tenths cc. per minute... and complete analyses can be made on samples as small as 5 cc.

▶ **HIGH SENSITIVITY:** Even very small traces of elements can be quickly and easily detected with the Beckman Flame Photometer... traces as small as a few parts per billion, depending upon the element being determined.

▶ **UNIFORM ACCURACY:** The temperature of the flame and rate of feed of the specimen can be held constant over long periods of time, permitting numerous individual measurements to be made in succession. High accuracy of the readings is not affected by fluctuations in gas or oxygen pressures.

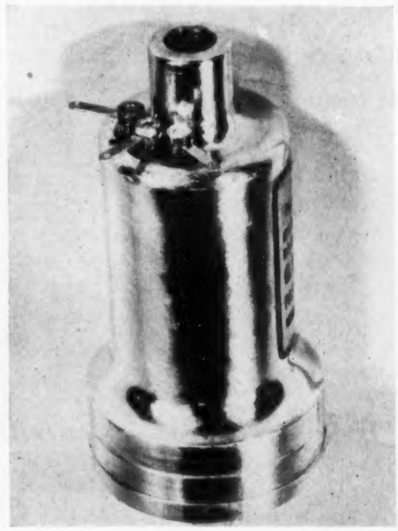
The above are only a few of many Beckman Flame Photometer features. Write for full details!

BECKMAN **INSTRUMENTS CONTROL MODERN INDUSTRIES**

Pressure Transducer QB 457

G. M. Giannini & Co. is now manufacturing a new pressure transducer in the range of ± 20″ of water. The type 4713 is of conventional dome-shape, but quite small and extremely light.

This transducer utilizes the slack-dia-



phragm principle of measurement. One end of a unique spring-linkage movement is fastened to the dome of the transducer, the other end is fastened to a bellows. Half of the spring is wound counterclockwise, the other half clockwise, and a microtorque potentiometer wiper is fastened at the center of the linkage.

As the bellows responds to changes in pressure, movement is transmitted to the bellows-end of the linkage. Since the spring is wound in two directions, a small movement at one end induces a large rotation of the wiper on the coil of the microtorque. This results in large voltage variations, or large outputs, for extremely small changes in presure.

Gate Valve QB 458

Incorporating the first application of full cylindrical body sections to bronze gate valves, the new Lunkenheimer "union bonnet" provides maximum distortion resistance. This valve is a 200 psi. bronze, double disc, gate valve with rising stem and screwed ends. It also comes in a flange end pattern, rated at 150 psi., in sizes ¼″-3″.

Among the features are: A patented silicon alloy stem material which eliminates stem-thread failures; hexagon head gland; beveled disc wing guides and body guide channels to make assembly easy when servicing the valve.

Humidifier QB 459

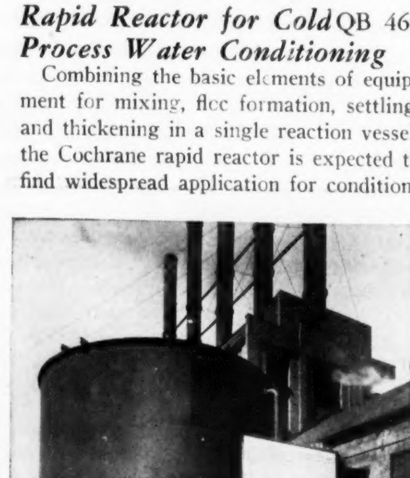
Spraying Systems Co. has now introduced a new unit for humidification. All essential parts are built into a cabinet 13⅞″ x 14¾″ x 6″ deep. The parts consist of four humidifying nozzles, water tank with float valve, water strainer, air filter, air regulator with pressure gauge, and solenoid operated valve. A humidistat for automatic control is also included as a part of this unit. The humidistat is separate from the cabinet and installation of both the humidistat and the cabinet can be made wherever desired.

The unit is supplied as standard with four nozzles that will atomize 35 lbs. of water per hour using 5 CFM of atomizing air supplied at 32 psi. The unit is also supplied in smaller capacities. The nozzles are individually adjustable for position in the cabinet so that the direction of the sprays may be set as required.

Operation of the unit is automatic and will maintain any relative humidity under the control of the humidistat.

Rapid Reactor for Cold Process Water Conditioning QB 460

Combining the basic elements of equipment for mixing, floc formation, settling, and thickening in a single reaction vessel, the Cochrane rapid reactor is expected to find widespread application for condition-



ing process cooling water and boiler feed. Chemical reagents may be introduced for coagulation of turbidity alone, for partial softening with coincident turbidity reduction, or for complete softening and turbidity reduction.

The raw water is introduced into an environment of chemical reagents and preformed precipitates, thoroughly agitated, discharged into a zone of relative quiescence at a controlled velocity, and finally

Before You Build a Heavy Chemical Plant

Ask Yourself These Questions:

"What

process is the most efficient? . . . is best adapted to use the raw materials most economically available to me?"

"Where

should the new plant be built? Can it be fitted in with present facilities without complicating maintenance problems?"

"When

will the plant be completed? How long will it take?"

"Who

should we choose to do the job?"

For many chemical plants producing industrial acids, synthetic ammonia, synthetic methanol and other heavy chemicals, the answer to the last question is Chemico.

Since 1914, Chemico has furnished authoritative answers to many chemical plant problems. Chemico chooses — and even develops — the proper process, specifies equipment, designs and builds the plant, trains the operating crew, and guarantees the plant's performance. Chemico assumes full responsibility.

"HOW DO I START USING CHEMICO'S EXPERIENCE?"

Ask for a preliminary consultation. This will involve no obligation. Just call or write Chemico today.

"Chemico plants are profitable investments"

CHEMICO CHEMICAL CONSTRUCTION CORP.

CHEMICAL CONSTRUCTION CORPORATION

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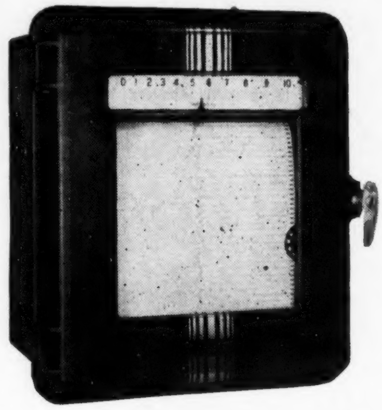
European Licensee of N. E. C. Process
Hydro-Nitro S. A., 8 Quai de Cheval Blanc, Geneva, Switzerland

Cables: Chemiconst, New York

passed into an integral settling and thickening reservoir from which it is collected for use.

Thermal Conductivity CO_2 Recording Device QB 461

As a means of checking on combustion efficiency, Micromax oxygen recording equipment, developed by Leeds & Northrup, can handle many applications beyond the scope of CO_2 recorders.



Micromax oxygen recorders operate on the thermal conductivity principle. Analysis for oxygen is accomplished by the "hydrogen-difference" method. This consists of adding hydrogen to the gas sample, removing oxygen by combustion, and electrically comparing the conductivity of the sample before and after oxygen is removed.

Face Shield QB 462

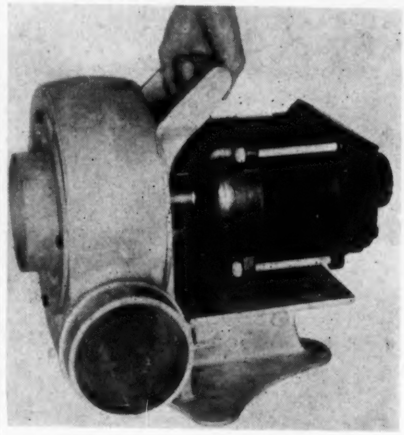
American Optical Co. is now producing a new plastic face shield to be worn in combination with the company's R-1000 and R-2000 respirators.

It is light in weight, durable and easy to attach to the respirators and protects the eyes and major part of the face against the impact of foreign particles striking from the front. Adding to durability, outer edges of the shield are protected by a vinyl plastic binding.

Motor-Driven Ventilator

Saf-T-Air, the new electric motor-driven ventilator of the United Electric Motor Co., has a capacity of 425 cfm. yet weighs only 50 pounds. Made of

non-corrosive spark-proof aluminum, its compact size allows it to pass through



small hatchways and hard to get to places. Saf-T-Air can be used either as blower or exhauster for eliminating hazardous gases, fumes, vapors, dust and foul-air from various inaccessible places.

● QB464 A new *stepless temperature controller,* the 1000 series Temcometer, is being produced by the Thermo Electric Manufacturing Co. This new instrument consists of only the controller portion of the series 500 temperature controller and indicator. The omission of the pyrometer and thermocouple (included in the 500 series) results in an inexpensive, modernly designed and engineered controller for applications where pyrometric indication of temperature is unnecessary or is already provided. The 1000 series controller is intended for use with electric heating devices.

● QB465 The latest *thermocouple* of the Instrument Division of the K. H. Huppert Co. is a closend-end type with a silver tip suitable for highly accurate temperature readings on hot metal, rubber or plastic surfaces.

● QB466 A new *vertical gearmotor* is the latest addition to the Westinghouse gear drive line of the Westinghouse Electric Corp. Each unit is a self-contained drive, consisting of a high speed motor and speed reducing unit. Nine different gear ratio combinations are available, ranging from 7.61:1 to 38.9:1.

These self-contained units are available in 3 to 50 hp., 220, 440 or 550 volt, 3-phase, AC, and 3 to 7½ hp., 115 or 230 volt, DC. They may be equipped with practically any standard motor.

Special features are: 1) all gears and bearings receive positive lubrication at all operating speeds; 2) quiet operating, single helical gears and pinions of 40 to 50 carbon steel are given the exclusive Westinghouse BPT "tough-hard" heat treatment before hobbing; 3) maximum strength and tooth overlap; 4) uniform loading—slow uniform wear; and 5) lower impact stresses from sudden shocks or reversals.

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Store Paper Bags Properly

THE LARGE increase in the use of multiwall paper bags—an increase which, incidentally, will be even more pronounced in the coming months—makes the following information, compiled by Bemis Bro. Bag Co., of timely interest to all users in the chemical industry:

Paper bags are strongest when they contain the proper amount of moisture. Allowing the moisture content of paper to drop below the normal 6% to 7% means loss of maximum strength, for the bags will dry out, become brittle, and lose their ability to "take it." When bag users encounter excessive breakage in the filling process, investigation will usually show that the bags have been stored in dry rooms and have thus been weakened by the loss of their normal moisture content. Restoring this moisture eliminates such breakage.

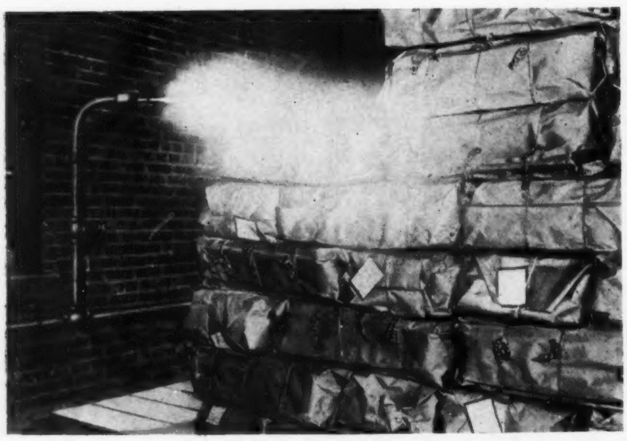
Why do paper bags dry out? It is because hot, dry air in a bag storage room makes up for its lack of moisture by taking it from the bags. Thus, it is important that relative humidity be maintained at a high level. Storage of paper bags in a humidity of 50% at warm temperature is desirable for maximum absorption of moisture by the paper.

Men in charge of paper bag storage will find several simple precautions helpful in maintaining or restoring proper moisture content for best paper bag performance: Avoid storing bags near furnaces, radiators or in rooms where heat is excessive unless the relative humidity is also maintained at a high rate. Don't store bags under roofs where the sun will create a dry "attic heat" that absorbs all moisture from the paper, nor in rooms that are poorly ventilated without proper humidification. Be especially watchful for dryness in paper bags during extremely hot or extremely cold weather. During cold weather, moisture content of the air may vary suddenly; when it's hot and dry, paper will lose moisture rapidly. Paper bags should not be used immediately after delivery, for often drafts through freight cars lower moisture content during shipping. Upon arrival bags should be stored in a humid room for 24 to 48 hours before filling.

After some experience with paper bags, it is not difficult to tell when they have become too dry. One simple test is to shake the bags briskly. If they "rattle" sharply (a condition easily recognized after a few tests) they are too dry for best performance on the packer and should be humidified before using.

There are several effective ways of maintaining proper relative humidity in paper bag storage rooms. If steam pipes are available, one way is to let steam escape into the room to keep the air humid. Storing bags on dunnage, away from the floor, and keeping the floor wet will also increase humidity, and its a good idea to open windows on damp or rainy days so that air in the storage room can absorb moisture from the outside air.

Makeshift humidifiers can be made from barrels. Hang cloths over the edge of a barrel filled with water. The cloth



Four methods are illustrated here of keeping paper bags at their optimum moisture content for strength and flexibility: (upper left) letting steam escape into the storage room; (upper right) wetting floors, with the bags stacked on dunnage; (lower left) draping rags over the side of a water barrel so that they act as a wick; and (lower right) drilling needle holes in a water pipe and covering them with rags.

Meet that Great Explorer ...the Multiwall Paper Bag!

Here's a way of packaging that's not confined to products where bags are taken for granted. St. Regis Multiwalls branch out, move into all sorts of new fields! They adapt themselves to all sorts of products where you might not think of *paper* as the standard container.

And wherever multiwalls go, they offer more economical, more efficient, and more sanitary packaging.

If you have a product that could conceivably be packaged in multiwall paper bags — anywhere up to 100 pounds — talk it over with one of our offices. They will tell you about differences in construction and closures. They will tell you, too, about specially designed bag filling equipment.

Over 400 products are now using multiwalls — and the end is nowhere in sight!

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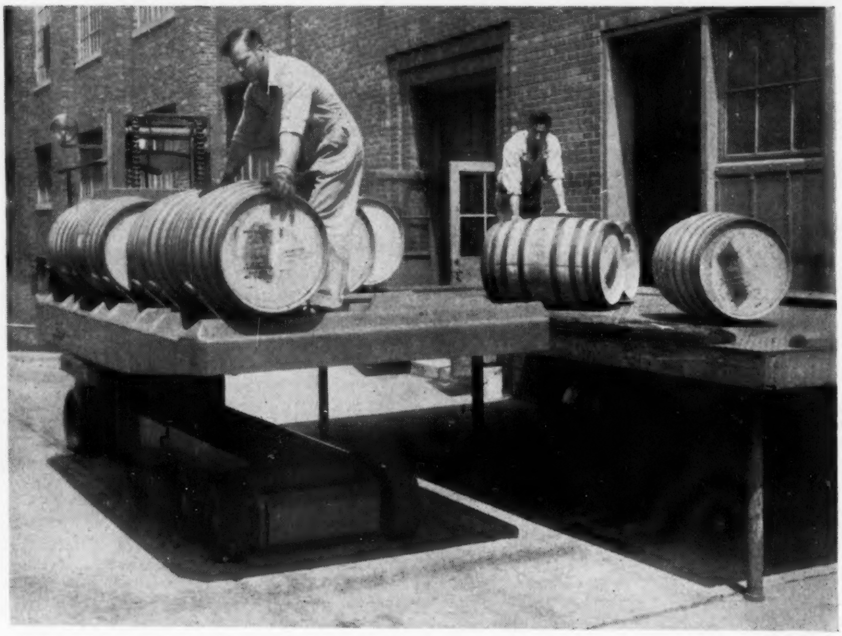
will act as a wick, absorbing water from the barrel and passing it on into the air. A different version of the same thing is to drill small "needle" holes in horizontal water pipes and hang cloths over these holes.

Many types of commercial humidifiers are available with capacities to suit individual requirements. When facilities for maintaining proper humidity conditions in paper bag storage rooms are not installed, this automatic equipment will prove to be a profitable investment. The compressed air type of humidifier requires air under 30 pounds pressure. This air passes through a nozzle with a whirling motion which draws water through the nozzle and expels it in an extremely fine mist. Control may be either manual or automatic.

Low or high pressure steam is used in another type of humidifier. The steam passes through a valve into the path of a fan which mixes it with dry air. Automatic control is maintained by a device which actuates the valve to open and close the steam port. The centrifugal type humidifier requires only ordinary water pressure for operation. The water feeds onto a whirling disc which converts it into a fine mist by centrifugal force. The mist is blown into the air by a fan attached to the humidifier.

Whether a bagging operation is large or small, reduced breakage and all around more satisfactory performance is obtained when paper bags are given the care necessary to insure proper moisture content.



Special high-lift platform truck handles 12 barrels or drums at once.

Lift Truck Speeds Barrel, Drum Handling

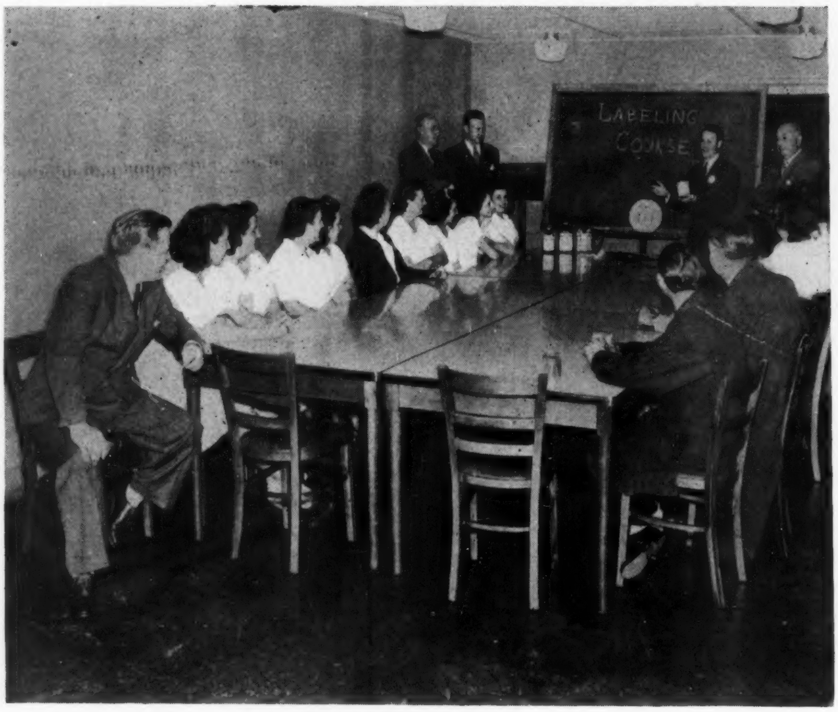
Hiram Walker and Sons, Inc., handles from three to twelve times as many barrels per truck as is handled by the conventional electric fork or platform truck. Thus, the cost of handling this type of container is greatly decreased. A specially-designed high lift platform truck handles twelve barrels at a time, whereas the conventional lift truck generally handles only from one to four barrels at a time—and in the latter case, skids or pallets are required.

The special Yale truck is used in transporting barrels from one location to another and in lifting loads from street levels to receiving-platform levels. Barrels are rolled directly from the truck platform onto the receiving platform without any manual lifting. Barrels are prevented from rolling off during transit by metal prongs inserted into the platform. The prongs can be removed as required when loading or unloading. The platform of the truck is of heavy welded steel construction. Raised ribs support the barrels at each end and prevent them from wobbling. A four-wheel forward outrigger supports and balances the long platform.

This type of truck can be used to advantage by anyone who handles barrels or drums in quantity—brewers, chemical suppliers, oil refiners, and food processors.

Labeling Course

So much is being discussed concerning labeling within the chemical industry that a training program for packaging personnel conducted by E. R. Squibb & Sons, in conjunction with the New Jersey Machine Co. and National Adhesives Co., is of particular interest. Complete courses in labeling were recently conducted at the Brooklyn, New York, and New Brunswick, New Jersey, plants. The courses varied slightly due to the individual labeling requirements of each



Squibb employees learn proper labeling techniques from representatives of their own company, New Jersey Machine Corp., and National Adhesives.

plant. However, the management of both plants stressed that labels must be applied carefully and permanently to assure that the identity of the contents of each package is displayed clearly.

Other subjects discussed at these conferences were the regulation and care of labeling machines, the nature of adhesives, their storage and handling, package selection, labeling methods, and the steps to be taken to avoid label failure.

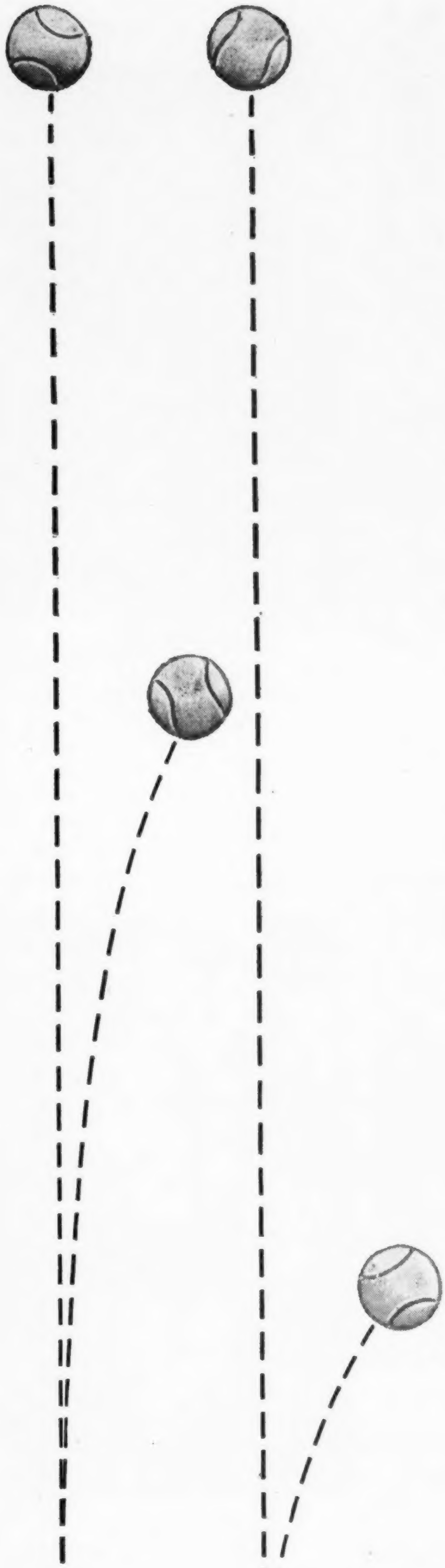
AMA Exposition

The American Management Association's Seventeenth Annual Packaging Exposition will be held in Cleveland, Ohio, during the week of April 26, 1948. In conjunction with this exposition, a four-day Packaging Conference on improvement of packages and shipping techniques will also be held. This exposition and conference is expected to attract more than 15,000 visitors, and it will be worth-while for anyone interested in packaging to attend.

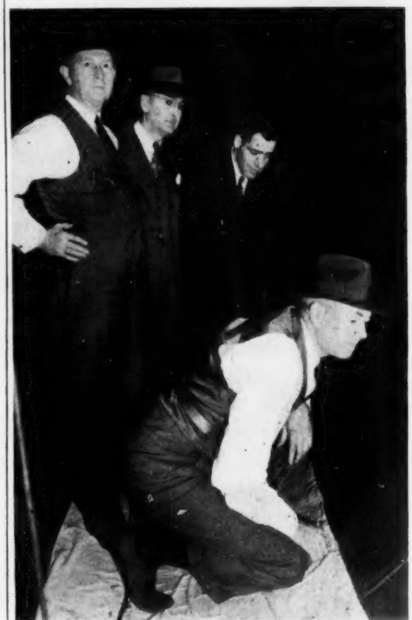
Fertilizer Shippers Decry Rate Increase

A temporary increase of 20 per cent in freight rates for fertilizers and fertilizer materials has been protested by several interested parties. The National Fertilizer Association, through its counsel, John T. Money, has filed a letter of protest with the chairman of the Interstate Commerce Commission, asking that consideration be given to these materials and that specified maximum increases be ordered for these commodities.

The Tennessee Valley Authority has filed a similar protest, with special reference to phosphate rock; and the transportation division of the U. S. Department of Agriculture has also filed a petition in which several state agencies and fertilizer manufacturers have joined.

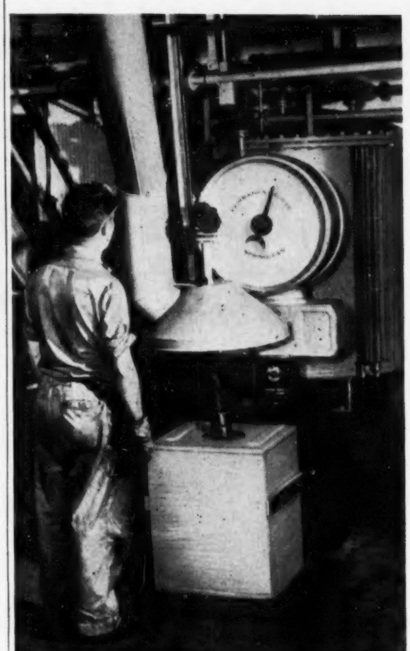


Tank Car Committee Sees Lining Applied



The Tank Car Committee of the Manufacturing Chemists Association met recently at Akron, where they visited plants of the B. F. Goodrich Co. Here members are inside a tank car being lined with rubber; such cars are used mainly for transporting hydrochloric and phosphoric acids.

Carboy Filling



Operator fills and weighs carboy in one operation at one of the "filling stations" at Heyden Chemical Corporation's Ford's, N. J., plant. Should the material being handled give off fumes, they are captured in the hood and drawn off by a suction fan.

PLANT OPERATIONS NOTEBOOK

WHY DO PAINT JOBS GO WRONG? ---PART I

Paint jobs fail for a variety of reasons. The Devoe and Reynolds Co. has recently brought these causes and effects together, providing an answer to the question posed in the title.

Alligatoring, Checking. This refers to a finish which is cracked in all directions, giving the appearance of an alligator hide. This is caused by applying a hard finishing-coat over a soft undercoat. It happens when the undercoat contains a large amount of oil or when the undercoat has not been allowed to dry thoroughly before painting over it. When the top coat is chilled it contracts and, if the undercoat is not firm, the top coat can split. The same trouble can occur if material is applied to a greasy surface.

Blistering. Blistering is usually caused by moisture in the surface on which the paint is applied. First, the moisture loosens the paint by partially dissolving the under surface. Then, when hot sun strikes the surface, it expands the air in the pores of the wood and pushes against the back of the paint with sufficient power to cause blisters.

Blisters can occur without the presence of moisture on either wood or metal surfaces when painting in the hot sun. If the paint dries on the surface before all the thinner has evaporated, further heat will vaporize the thinner and cause thousands of tiny blisters. This is particularly true of dark colors which absorb more heat.

Blistering is never the fault of the paint, although some paints will resist blistering more than others.

Often condensation troubles can be relieved by boring half inch holes at the top and bottom of the walls to permit circulation of air. Holes should be stuffed with screen wire to keep out insects.

Peeling, Flaking, Cracking, Scaling. Blisters eventually crack and cause peeling. Therefore, all causes of blistering are also causes of peeling.

Certain woods and sheet metals expand and contract considerably with changes in moisture content or temperature. This will cause cracking and peeling unless the paint is very elastic.

Resin from knots and sap streaks will make paint brittle unless properly coated with shellac or aluminum paint.

Paints and varnishes contract as they dry. Therefore, if applied to a coating which is loosely attached they will pull off the loose coating. This is, of course, the fault of the old coating. In like manner cracking and peeling will result if material is applied over a greasy or waxy surface.

Peeling or chipping also occurs when material is applied over a hard glossy surface. Such surfaces should be sanded or washed with a solution of a half cupful of sal soda to the gallon of warm water and rinsed before refinishing.

Chalking. Mild chalking of an exterior paint which occurs a year or two after application without any great change of color is desirable, since it gives a good surface for repainting. Paints which do not chalk are liable to crack and give a bad surface for repainting. Rapid, heavy chalking which leaves the surface unprotected is known as "washing" and is generally caused by applying outside paint in cold, damp weather. Heavy chalking is also caused by over-thinning or spreading either the undercoat or finish coat too far.

Discoloration. White and light colored paints containing lead are darkened by hydrogen-sulfide gas from sewage or industrial fumes. This usually occurs while the paint is fresh and soft. The discoloration can usually be removed by sponging the surface with hydrogen peroxide or a very weak solution of acetic or hydrochloric acid. The surface should then be hosed with water. Special fume proof paint is required in certain areas.

Fading. High quality exterior paints are made with permanent pigments and seldom fade. When an outside paint seems to have aded in spots it is genarally caused by applying the paint to a surfoce which was more porous in some spots than others. The oil or varnish in the paint soaks into these porous spots and leaves the surface with insufficient oil or varnish. This may not show up at once but as weathering progresses these spots become flat while the remaining surface is still glossy. The flat spots will generally be lighter in color than the glossy areas. It can be shown that these spots have not faded by wetting them, which brings back their color.

On interior walls the same results occur when a paint is applied over a patched wall without spot coating the patches. The paint soaks into the patching plaster and shows as a lighter spot in the surface. A similar complaint often occurs when a single coat of flat paint is applied to a previous coat of flat paint. The result is usually a cloudy appearance which is caused by the fact that the undercoat was applied more heavily in one place than

another, thus causing suction spots. When repainting a flat wall paint it is necessary either to use a first coat of equal parts undercoat and flat, followed by flat, or else to use a "one coat" flat.

Non-drying. This is one of the most frequent causes of complaints. It is seldom the fault of the material because brush-out tests of all batches are made in the plant laboratory and, if they do not dry properly, the fault is usually corrected before the material leaves the factory.

There are many causes of slow drying. Outdoor paint requires light, moderate warmth and moderate dryness. Paint applied in cold damp weather will dry slowly, particularly in the absence of light.

On interior work the ideal drying temperature is between 60° and 75° and there *must* be ventilation—windows should be opened slightly at top and bottom. Even under such conditions materials will not dry properly if weather is very muggy.

No material will dry over a greasy or waxy surface—finger marks, soot, use of oily rags or mop, failure to remove floor or woodwork wax *completely.*

Paint and varnish remover contains wax. If, after removal, the surface is not thoroughly washed with turpentine or other suitable solvent, no material will dry. Particular care should be taken in removing wax from corners.

Thinning with kerosene or gasoline or adding oil to varnish or enamel will cause slow drying. Applying material over a damp surface or with a brush which has been kept in water will prevent drying.

Applying material over undercoats which are not thoroughly dry will cause slow drying and alligatoring.

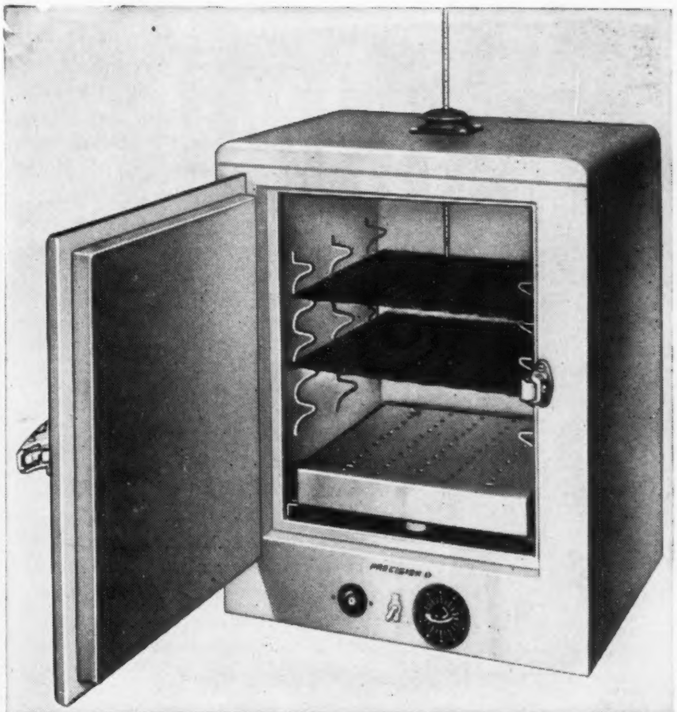
Slow drying is often caused by applying coats which are too thick, particularly on floors. This may be caused by not brushing the material out or by not thinning as much as recommended in directions. As thinner evaporates from material, more should be added to bring it to proper consistency. Also additional thinner should be added in muggy weather.

Non-hiding. Non-hiding may be caused by failure to stir and mix material properly, leaving part of pigment at the bottom of the can. Too much thinning will, of course, cause poor hiding. Also improper brush work, such as brushing away from, instead of back into, the completed work.

Applying material to a glossy surface may cause poor hiding as the material may slide over some spots leaving a thin coat in certain areas and a heavy coating in others.

Poor hiding may be caused by failure to tint the undercoat or by attempting to cover an imperfect surface with one coat. Rough spots should be spot coated, because most materials tend to flow away from sharp edges.

When an interior paint will not hide the



trouble can sometimes be corrected by stippling.

Sagging. Sagging or curtaining may be caused by applying material in too heavy a coat or unevenly or attempting to finish a surface which is too glossy. If material sags, brush it upward with long even strokes before it sets, wiping the brush after each stroke.

Shiners. These are spots which show up with more gloss than the rest of the surface. May be caused by painting over a hard glossy surface—the brush slides over some places and the shiny undercoat shows through.

If an absorbent surface is spot coated with a non-absorbent material (such as shellac) the liquid from the new paint cannot soak in at that point and may show more gloss.

When painting a wall or ceiling, if one strip is allowed to partly dry before the next strip is painted, the lap where the strips join may be shiny. Therefore, never start a ceiling unless the whole surface can be finished and never pause in painting the walls of a room except at a corner.

Flat wall paint (particularly dark colors) may show glossy spots wherever there are heavy brush marks. Stippling will usually prevent this.

Wrinkling. Wrinkling is caused by applying too thick a coat. The surface dries quickly but there is an undried portion underneath. As the under part dries and contracts, the top surface wrinkles. This can be avoided by adding thinner to over-thick paint or by applying plenty of elbow grease and brushing out the paint to avoid thick films.

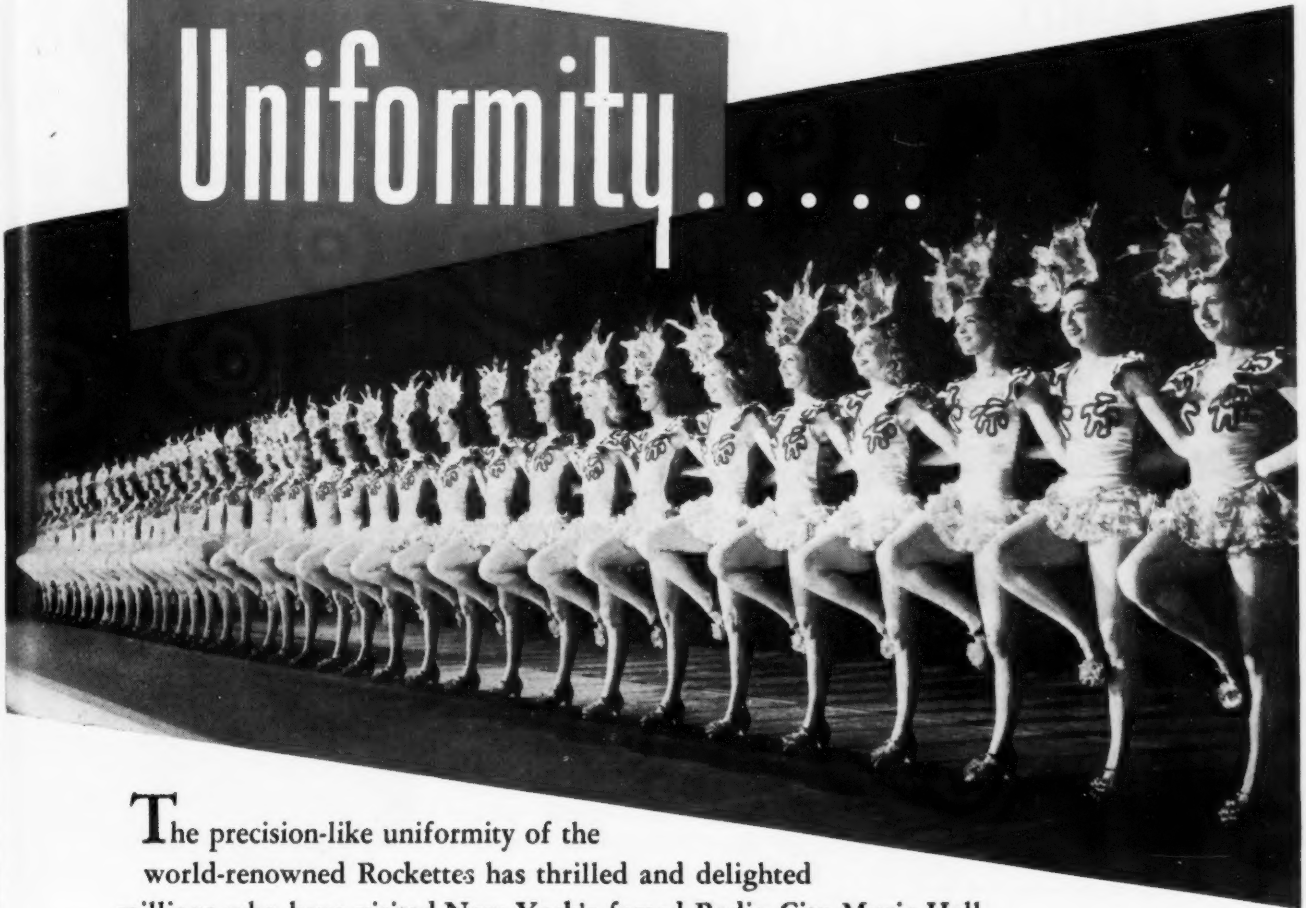
Use of Accident Data

Reuel Stratton of the National Safety Council, in a reference to a misuse of safety data notes the misinterpretation of the terms "type of injury" and "cause of accident." As Mr. Stratton says, these terms are not synonymous. Statistically, "type of injury" means very little However, if a study of the various types of injuries is made, it can be used to determine the exact fundamental causes of the accident.

Determination of these causes will enable the plant engineers to ascertain whether physical or engineering changes are required. If the cause is a personal act, methods can be developed by which the employee can become familiar with the fundamental hazards involved, prevent accidents and, if injuries do occur, make certain that they will not occur in the future.

"Only through constructive and intelligent use of accident data can the real focal point of the accident problem be determined. Then correct steps may be taken to institute the necessary preventive measures or educational procedures."

Uniformity.....



LABORATORY NOTEBOOK

Sensitive Calorimeter for Hydrocarbon Research

The search for better petroleum fuels is being facilitated by a new and highly sensitive apparatus for measuring the heat required to vaporize liquids.

The new apparatus is capable of an accuracy of about $\frac{2}{100}$ to $\frac{3}{100}$ of one per cent under ideal conditions, and even with small samples of doubtful purity the measurements have been accurate to $\frac{1}{10}$ of one per cent.

Since some of the pure hydrocarbons are available only in relatively small amounts, the apparatus is designed to test samples of about $\frac{1}{6}$ pint, but vaporization experiments have been successfully carried out with as little as $\frac{1}{50}$ pint of fuel. This is made possible by an elaborate system of copper conductors which spread heat from an electric heater evenly to all parts of the sample being tested.

Vital parts of the apparatus are provided with extra heat shields which insure the temperature uniformity necessary for very accurate measurements. Also there are provided electronic controls which automatically regulated the temperature of vital parts.

Seventy-one purified hydrocarbon compounds, typical components of gasoline, have been tested in the new apparatus at the National Bureau of Standards.

Recording Titrator

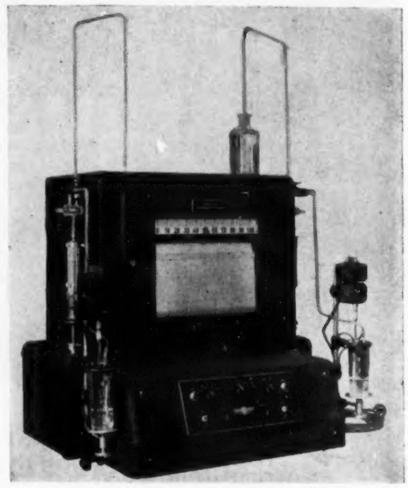
The first dual automatic recording device ever designed for plotting automatic titration curves, has just been introduced by Precision Scientific Co. of Chicago. The new device provides a permanent and complete record of titration curves. It eliminates all work on part of operator, except that of preparing solutions and loading the feed unit. Since the device includes two complete titration set-ups, a second sample may be prepared for analysis while another is being titrated.

The "Precision"-Dow Dual Recordomatic titrator is recommended for routine control work, as well as experimental research. The titrator is equally well suited for aqueous and non-aqueous media. It can be used with silver, antimony, platinum, calomel or glass electrodes. There is no danger of polarizing the electrode system.

The instrument consists of two parts: (1) a reagent-feeding device, and (2) a recording potentiometer.

(1) The reagent feeding unit includes two complete set-ups consisting of 50-ml. syringe to hold and feed reagents to the titration beakers containing the solution under analysis and the indicating electrodes Solenoid-operated shifting permits selection of right or left system for titration. Syringe and strip chart are both driven by a relay-operated motor during titration. The syringe feeds reagent into the titration beaker at the rate of about 2.5 ml. per minute.

(2) For recording and controlling the titration, a modified Brown Electronik



potentiometer is used. The input to the potentiometer consists of a line-operated vacuum tube amplifier of the balanced tube type. Five meter scale and potentiometric circuits are provided which give the instrument a total range of —1.5 to +1.5 volts, and a full pH range of 0 to 14.

Titration control is concerned primarily with limiting the reagent so as to obtain recorded e.m.f. values which closely approach equilibrium values. Fairly constant reagent addition is obtained during the early stages of titration, when buffering action is strong. The additions become more and more widely spaced as the end point is approached.

Diamonds Detect Atomic Radiation

Radioactivity studies have shown that diamonds are highly sensitive to gamma rays and may be used to detect this radiation in the same way as a Geiger-Müller counter. It has been found that a diamond placed in a strong electric field initiates sharp electrical pulses when gamma radiation is absorbed, and, as with a Geiger counter, a count of pulses gives an indication of the intensity of the radiation. The diamond counter has not yet been tested for beta radiation, but it is expected that a similar effect may be observed in this case.

To use a diamond as a counter, it is clamped between two small brass electrodes maintained at a difference in po-

CELANESE*

CP ACETONE

Celanese CP Acetone is being produced in tank car or drum quantities to meet industrial requirements. This high quality ketone is being supplied in accordance with the following specifications:

Acetone Content	99.5% min.
Sp. Gr., 20/20°C.	0.7915—0.7930
Distillation Range	1°C. incl. 56.1°C.
Color	5 APHA max.
Acid as Acetic	.002% max.
Alkalinity as NH_3	1 ppm max.
Non-Volatile	Max. .001 gr. per 100 cc sample
Permanganate Time	2 hours min.
Aldehydes	None
Water	Less than 0.5% (miscible with 19 vol. 60° Be' gasoline at 20° C.)

A new brochure is available containing specifications and general information on many of the Celanese* organic chemicals. Write for your copy—and call on Celanese whenever you need technical assistance regarding organics.

CELANESE CORPORATION OF AMERICA
Chemical Division
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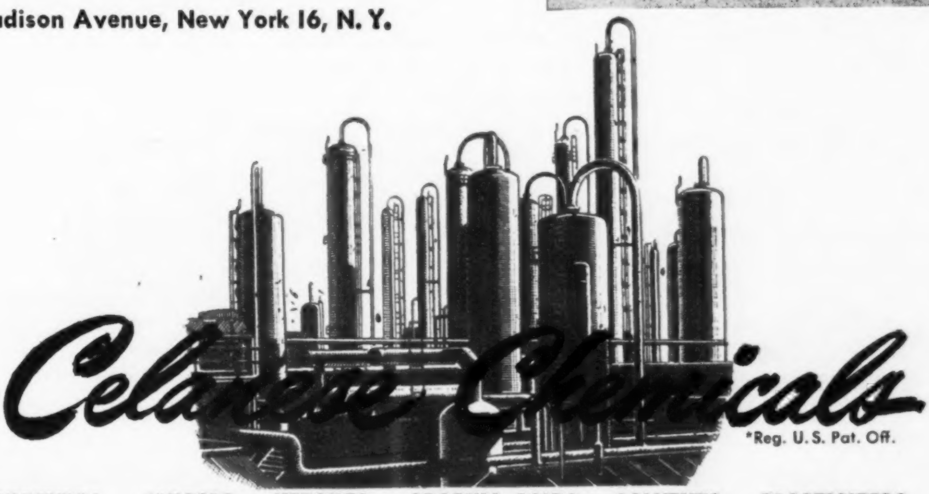


*Reg. U. S. Pat. Off.

ALCOHOLS • ALDEHYDES • GLYCOLS • KETONES • ORGANIC ACIDS • SOLVENTS • PLASTICIZERS • INTERMEDIATES

tential of about 1000 volts.* When a source of gamma radiation is brought within range of the diamond, there occur across the electrodes pulses of current, which after amplification may be detected and counted on any suitable indicating device, such as an oscilloscope, a current meter, a set of earphones, or a loud speaker. In the apparatus assembled at the National Bureau of Standards, Washington 25, D. C., primary amplification is effected with minimum loss of original intensity through the use of a triode very close to the diamond in the circuit. The output from this tube is then applied to a two-stage amplifier, from which pulses of sufficient magnitude are obtained to operate the instrument.

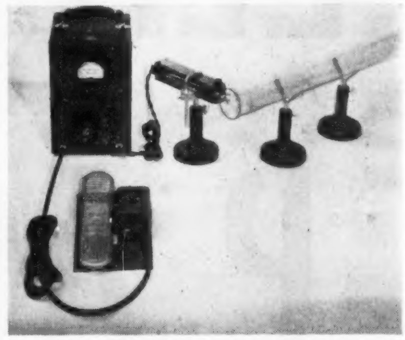
The pulse-producing property of the diamond is thought to be a result of its highly symmetric crystalline structure, characterized by a very regular arrangement of carbon atoms with relatively large intervening spaces. According to this theory, when a photoelectron is emitted by a diamond atom as the result of the absorption of gamma radiation, the freed electron is accelerated through the interatomic space toward the positive electrode. Within a very short distance it acquires such high velocity that other atoms along its path are ionized by collision with the release of additional electrons, which in turn are accelerated in the same direction. This multiplication of charges repeats itself in rapid succession, producing a sudden avalanche of electrons equivalent to a small pulse of current. The larger the diamond the more electrons would be involved in the sudden pulse that is counted. This means that the gamma-ray sensitivity of a diamond counter should be proportional to the size of the crystal. However, adequate sensitivity is obtained with a comparatively small diamond. Apparently the diamond quickly recovers from its ionized state, as the pulses registered are extremely sharp. The diamond counter is thus a very "fast" counter, capable of indicating a much greater number of pulses per minute than is possible with the Geiger-Muller counter. The diamond is the only material so far investigated that performs satisfactorily at room temperature.

Industrial diamonds used as counters must be colorless and absolutely free of flaws; about one diamond in forty meets these specifications. The conventional radiation counter lasts from three months to two years, depending upon how much it is used. A diamond counter, on the other hand, is practically indestructible, although extremely long use might produce discoloration or flaws, with a corresponding loss in sensitivity. There is no appreciable cost difference between the diamond and an ordinary counter. However, one of the important advantages of the diamond cutter is its small size, permitting use inside the human body or in small openings in industrial equipment.

Glass Tubing Cutter

For many years a simple hot wire has been used to cut glass tubing. The new Even Heat glass tubing cutter of Eberbach & Son Co. has many refinements.

With this cutter glass tubing up to 7½" outside diameter can be cut in any position, as a separate piece or as an integral part of apparatus already set up. Adjustable supports are provided for the hot wire cutting unit and for the tubing when individual pieces are to be cut. The hot wire cutting unit can be used in any position when detached from its support, and a foot switch is available as an accessory.



Power for the variable length cutting wire is supplied by a special power unit, and a meter on this unit enables the operator to balance the electrical output with the variable wire length.

The hot cutting wire carries a low voltage which is isolated and insulated from the power line.

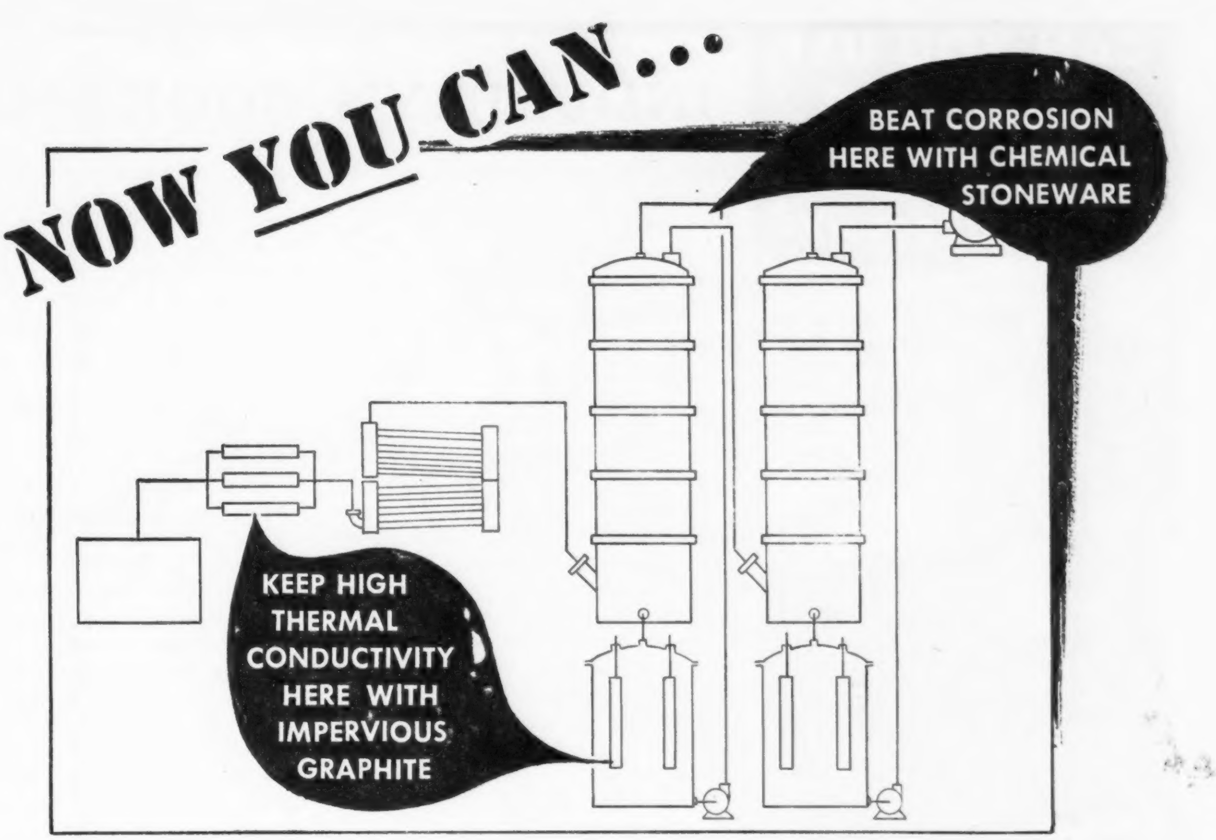
Equation Computer

An improved electrical device for predicting the behavior, reactions and properties of chemical substances was developed recently in the chemistry department of Northwestern University. It is a potentiometric secular equation computer.

Designed by Arthur A. Frost, assistant professor of chemistry, and Milton Tamres, research assistant, the computer allows the operator to obtain computations in one-tenth of the time usually required.

Chemical compounds, like all matter, are composed of molecules which, in turn, are groupings of atoms. Each molecule has one or more fundamental vibration frequencies. It is these vibrations which the calculator utilizes. For example, suppose a petroleum chemist is seeking a theoretical calculation of the energies of various molecules in a chemical compound, such as aviation gasoline. He wants to know the behavior, reaction and properties of a certain hydrocarbon, a standard component of such fuel. Taking two known factors, the weight of the atoms involved, and the forces between these atoms, he sets certain dials according to these pieces of information. By proper manipulation he obtains the desired result.

The forces between atoms also can be determined by using the computer, from a knowledge of the number of electrons and the nuclei making up the molecule.



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"Shopping around" for the right combination of process plant equipment is now a has-been. To meet the tightest demands for corrosion resistance, shock resistance, and thermal conductivity . . . General Ceramics is now prepared to supply equipment fabricated *in whole or in combination* from both Chemical Stoneware and Falls Impervious Graphite.

This means: the extreme *corrosion proof* properties of chemical stoneware to all acids except hydrofluoric . . . *plus* the high heat transfer, thermal and mechanical shock resistant properties of Falls Impervious Graphite, economically combined where each is most needed in *one* process—planned and installed by *one* company, General Ceramics.

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In addition to the manufacturing facilities of the Chemical Equipment Division those of the Insulator Division are also available for handling ceramic problems in all branches of industry. General Ceramics & Steatite Corporation is therefore able to offer service covering all industrial applications of ceramic products.

INDUSTRY'S BOOKSHELF

Plastics

PLASTICS THEORY AND PRACTICE, by *C. C. Winding* and *R. L. Hasche*. McGraw Hill Book Co., 1947. 280 pgs.; $3.50. Reviewed by W. C. Goggin, Dow Chemical Co.

THIS BOOK is primarily designed for chemists and chemical engineers who wish to specialize in the field of plastics by building up on their foundation of chemical knowledge. It presupposes a knowledge of organic chemistry. Its early chapters are designed to orient the chemist by classifying the maze of plastic materials and describe the basic principles of plastic material syntheses. This is immediately followed by a section on commercial plastic fabrication end products and their related properties. A glimpse of the end results enables the reader to understand and justify the chemical processes he reads later.

With this background the reader is then given a valuable section on high molecular weight natural products and their derivatives. Condensation resins, resins resulting from polymerization reactions (polyethenic) are given thorough treatment from the standpoint of their chemical syntheses without diverting the reader by a mass of extraneous details.

Here Dr. Hasche's study of the plastic industry in Germany as a U. S. Army Consultant has made it possible to include some plastic production information only recently available. Similar products are produced in the United States but the processes were undisclosed.

The newest field of plastics—silicones—is given a special section as is rubber and synthetic rubber.

An extensive appendix including bibliography, trade names, major companies, list of visual aids and index make the volume complete.

Insecticide Compounds

A CATALOGUE OF INSECTICIDES AND FUNGICIDES—VOL. I—CHEMICAL INSECTICIDES, compiled by *Donald E. H. Frear*. Waltham, Mass., the Chronica Botanica Co.; New York City. Stechert-Hafner, Inc. 1947, $6.50. Reviewed by R. H. Wellman, Carbide and Carbon Chemical Corp.

THIS IS the most ambitious compilation that has yet appeared in the field. It gives in a condensed form, information on the results obtained on various insects and indicates concentrations tested with references. An unusual and very valuable feature is the chemical coding system of arranging compounds so that compounds containing any specific groups or combinations of groups can be found. This should be a great aid in attempting to find correlations between chemical constitution and insecticidal action.

A disadvantage is that various workers have not used the same techniques and yet results are reported without regard for technique. Thus it is a much more severe test when armyworm feeding records are taken after 76 rather than 24 hours. It is unfortunate that the patent literature has not been more adequately covered. For instance, U. S. Patent 2,200,564 covering the phthalonitrile as an insecticide is not cited, though other work on phthalonitrile is. In addition to the suggested use by chemists, entomologists and plant pathologists this book should be of great value to patent lawyers as the first reference when starting a patent search in this field. It is to be hoped that periodic supplements will keep this work up to date.

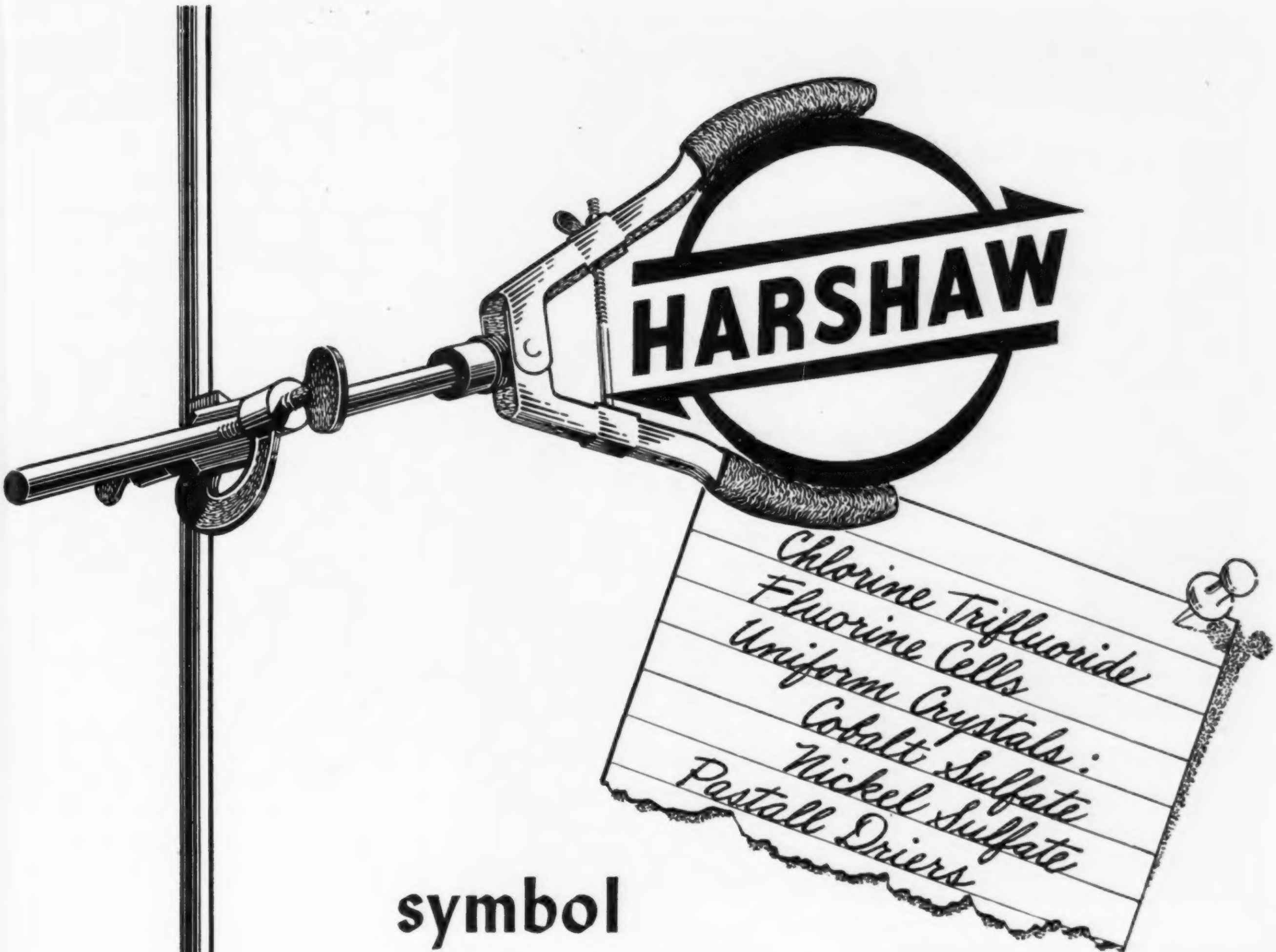
Fatty Acids

FATTY ACIDS, THEIR CHEMISTRY AND THEIR PHYSICAL PROPERTIES, by *Klare S. Markley*. Interscience Publishers, Inc., New York, 1947. 668 pp.; $10.00. Reviewed by Herman W. Zabel, Engineering Editor, CHEMICAL INDUSTRIES.

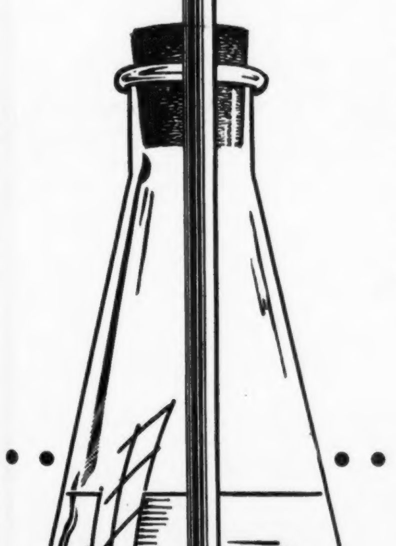
BASICALLY this treatise is a literature search on the subject of fatty acids and fatty acid derivatives. The author has carried out the purpose noted in the title, particular attention being paid to the long-chain acids. However, as many of the reactions and fatty acid derivatives have been studied only for the lower members of the series, some mention of the short-chain acids could not be avoided.

In addition to his very complete discussion of fatty acids derived from natural sources, the author carries a short section outlining the progress which was made in Germany before and during the war in the synthesis of fatty acids from paraffinic or olefinic hydrocarbons.

There is an extensive compilation of the data now extant on the physical properties of the hydrocarbons and the author has attempted to clarify the unfortunate situation which has arisen because many of the data on physical properties were obtained before even moderately pure samples of the acids had been prepared. The book represents an excellent compilation of the extensive literature on fatty acids which



HARSHAW
Chlorine Trifluoride
Fluorine Cells
Uniform Crystals:
Cobalt Sulfate
Nickel Sulfate
Pastall Driers



is now available to the researcher in the field. As such, it should be of great assistance.

Books Received

Chemical Process Principles, Part II: Thermodynamics by O. A. Hougen and K. M. Watson. John Wiley & Sons. $5.00.

Chemical Process Principles, Part III: Kinetics and Catalysis by O. A. Hougen and K. M. Watson. John Wiley & Sons. $4.50.

The Chemistry and Technology of Waxes by Albin H. Warth. Reinhold Publishing Corp. $10.00.

The Essential Oils, Volume I, by Ernest Guenther. D. Van Nostrand Co., Inc. $6.00.

Fundamentals in Chemical Process Calculations by Otto L. Kowalke. The MacMillan Co. $2.80.

An Introduction to Chemistry by Imo P. Baughman. W. B. Saunders Co. $3.00.

Manual for Process Engineering Calculations by Loyal Clark. McGraw Hill Book Co. $6.00.

Micromeritics—The Technology of Fine Particles by J. M. DallaValle. Pitman Publishing Corp. $8.50.

Other Publications

THE FUNDAMENTAL WORK ON THEORY, APPARATUS AS WELL AS PROCEDURES OF DISTILLATION AND RECTIFICATION, edited by H. Stage and G. R. Schultze, a compilation of the literature from 1920 to 1944. Translated from the German work published in 1944 by VDI. Hobart Publishing Co., Box 4127 Chevy Chase Br., Washington 15, D. C. 179 pgs. $4.00.

TUBE FITTERS' MANUAL, Handbook No. 111, on the selection, sizing, layout and installation of metal tubing circuits. The Parker Appliance Co., 17325 Euclid Ave., Cleveland, Ohio. 76 pgs. $1.00.

DIRECTORY OF MANUFACTURERS, St. Louis Industrial Area. St. Louis Chamber of Commerce, 511 Locust St., St. Louis, Mo. 74 pgs. $3.00.

MANUAL OF LABORATORY SAFETY, accident prevention, first aid, fire prevention, safety equipment. Fisher Scientific Co., Eimer and Amend, Grennwich and Morton Sts., New York, N. Y. 34 pgs.

DEVOE PAINTING GUIDE, the proper use of paint and related materials. Sales Training Dept., Devoe and Reynolds Co., Inc., 787 First Ave., New York 17, N. Y. $.50.

A. S. T. M. STANDARDS ON PETROLEUM PRODUCTS AND LUBRICANTS (WITH RELATED INFORMATION), methods of testing, specifications, definitions, charts and tables. A. S. T.M., 1916 Race St., Philadelphia, Pa. 710 pgs., $4.75.

ELECTRETS by Thomas A. Dickinson, the fabrication of general purpose electrets from plastics. Plastics Research Co., P.O. Box 346, Alhambra, Cal. 32 pgs., $2.50.

NOVI LIBRI, a current bibliography of scientific Scandinavian literature published by Einar Munksgaard, 6, Norregade, Copenhagen, Denmark. No charge.

THE FLOW DIRECTORY, a compendium of materials handling information. Industrial Publishing Co., 1240 Ontario St., Cleveland, Ohio. 404 pgs. No charge.

SUMMARY OF TECHNICAL AND PATENT ASSETS. 1948 edition. Phillips Petroleum Co., Bartlesville, Okla. 223 pgs.

BOOKLETS & CATALOGS

Chemicals

Dyes **B374**
"Determination of the Solubility of Dyes". Bul. No. 801, Calco Chemical Division, American Cyanamid Co.

Nylon **B375**
"Nylon Textile Fibers in Industry". 30 pgs., Nylon Division, E. I. du Pont de Nemours & Co.

Chloroplast Pigments **B376**
"Chloroplast Pigments". 46 pgs., Midwest Extraction Co.

Price List **B377**
"Price List of Schwarz Fine Chemicals". 4 pgs., Schwarz Laboratories, Inc.

Resin Adhesives **B378**
"Cyanamid Resin Adhesives". 12 pgs., Plastics Division, American Cyanamid Co.

Diatomaceous Earth **B379**
"Celatom". Eagle-Picher Co.

Plastics **B380**
"Fiberglas Reinforced Plastics". 36 pgs., Owens-Corning Fiberglas Corp.

Paint **B381**
"When Painting Metal". 4 pgs., American Chemical Paint Co.

Synthetic Organics **B382**
"Synthetic Organic Compounds". Bul. C-7-103, Chemical Division, Koppers Co.

Synthetic Coatings **B383**
"Heresite". 30 pgs., Heresite & Chemical Co.

Nitrogen **B384**
"The Nitriles". 19 pgs., Synthetic Organic Chemical Dept., American Cyanamid Co.

Phenyl Mercurics **B385**
"Phenyl Mercurics". 21 pgs., Metalorganics, Inc.

Pyrethrins Synergists **B386**
"Octancide 264". 15 pgs., Van Dyk & Company, Inc.

Toxaphene **B387**
"Toxaphene, A Chlorinated Hydrocarbon with Insecticidal Properties". Bul. No. 264, Technical No. 36, 26 pgs., University of Delaware Agricultural Experiment Station.

Equipment

Dew-Point Control **H179**
"Blaw-Knox Gasoline Absorption and Stripping Plants . . . Hydrocarbon Dew-Point Control". Bul. No. 2225, 24 pgs., Blaw-Knox Construction Co., Chemical Plants Div.

Conveyors **H180**
"Link-Belt Bulk-Flo", for flowable granular materials. 48 pgs., Book No. 2175, Link-Belt Co.

Plating Barrels **H181**
"Plating Barrels—Mercil Type". 18 pgs., Bul. PB 107, Hanson-Van Winkle-Munning Co.

Fat Splitting **H182**
"Continuous Fat Splitting, The Colgate-Emery Process". 6 pgs., Bul. 2220, Chemical Plants Div., Blaw-Knox Construction Co.

Driver **H183**
"The M-S-A Velocity Power Driver Model B". 2 pgs., Bul. No. Ta-14, Mine Safety Appliances Co.

Cell **H184**
"Baldwin SR-4 Load Cell". 2 pgs., Bul. 271, The Baldwin Locomotive Works.

Rotameters **H185**
"SK Rotameters, Specific Gravity Indicators and Flow Indicators". 36 pgs., Bul. 18-R, Schutte and Koerting Co.

Extrusion Equipment **H186**
"Blueprint for Industry, Part IV, Continuous Extrusion Takeup Equipment". 12 pgs., Industrial Ovens, Inc.

Timing Motors **H187**
"Haydon Timing Motors and Devices". 16 pgs., Cat. No. 320, Haydon Mfg. Co., Inc.

Fabrics **H188**
"Coated Fabrics Engineered for Upholstery". 8 pgs., Fabrics Div., E. I. du Pont de Nemours & Co., Inc.

Paper Bags **H189**
"How to Get Best Performance from Bemis Paper Bags". Bemis Bro. Bag Co.

Temper Designations **H190**
"Alcoa Temper Designations for Cast and Wrought Products". 15 pgs., Aluminum Company of America.

Turbines **H191**
"Whiton Steam Turbines". 8 pgs., Cat. No. ST101, Whiton Machine Co.

Rectifiers **H192**
"The New Look in Selenium Rectifiers". 1 pg., Bul. 116, Clark Electronic Laboratories.

Tantalum **H193**
"The Metal Tantalum". 20 pgs., Fansteel Metallurgical Corp.

Tablet Inspection **H194**
"The Lakso Tablet Inspection Unit". 4 pgs., The Lakso Co.

Nutrition **H195**
"Food and Nutrition Studies". 8 pgs., Foster Dee Snell.

Coupling **H196**
"Dodge Taper-Lock Flexible Coupling". 8 pgs., Bul. A-410, Dodge Mfg. Corp.

Chemical Industries, 309 W. Jackson Blvd., Chicago 6, Ill. (3-8)

I would like to receive the following free booklets and catalogs.

B374	B378	B382	B386	H182	H187	H192
B375	B379	B383	B187	H183	H188	H193
B376	B380	B384	H179	H183	H188	H193
B377	B381	B385	H180	H185	H190	H195
			H181	H186	H191	H196

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Ketones

ETHYL BUTYL KETONE

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in the manufacture of lacquers and

synthetic resin coatings.

	Diisobutyl Ketone	Ethyl Butyl Ketone
FORMULA	$C_4H_9COC_4H_9$	$C_4H_9COC_2H_5$
Boiling Point at 760 mm. Hg	168.1°C.	147.8°C.
Toluene Dilution Ratio at 20°C. ½ sec. R.S. Nitrocellulose	1.5	2.6
Viscosity, 18% "Vinylite" resin VYHH Solution	Gel Structure	112 cps
Evaporation Time (Butyl Acetate = 8 hr.)	44 hr.	14 hr.
Weight per gal. at 20°C.	6.73 lb.	6.8 lb.
Specific Gravity at 20/20°C.	0.8089	0.8197

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Dispersant—Best all around resin dispersant available for making organosols based on VINYLITE resin VYNV. Makes possible semi-hard and hard metal coatings containing little or no plasticizer, and aids in the preparation of highly plasticized coatings for cloth and paper.

Solvent—Retards premature evaporation in brushing lacquers, and reduces blushing in air-dried lacquers. Gives better flow-out and gloss to baked finishes.

ETHYL BUTYL KETONE

Dispersant—Produces fluid organosols having good viscosity stability on aging. Permits high solids content and makes good, clear films without checking ("mud cracking").

Solvent—Good solvent in both air-dried and baked finishes based on nitrocellulose or vinyl resins. Less active in lifting undercoats.

Intermediates—When condensed with amines and other chemical groups capable of reacting with the carbonyl group, these ketones give compounds of interest as inhibitors, rubber accelerators, dyes, pharmaceuticals, and insecticides. Ask for technical literature on diisobutyl ketone F-6934, and ethyl butyl ketone F-6918—when writing please address Dept. D-3.

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NEWS OF THE MONTH

Texaco Synthetic Fuel Development

Texaco Development Corp. is now prepared to license anyone within the petroleum industry to manufacture synthetic gasolines by means of the Hydrocol Process. The new process resulted from the joint and continuing research efforts of Hydrocarbon Research, Inc. and The Texas Co.

It is this process which will go into operation on a large commercial scale early in 1949 at the Hydrocol plant at Brownsville, Texas and at the Stanolind plant at Hugoton, Kansas. Each of these plants, when completed, will produce more than 300,000 gallons per day of synthetic gasoline.

A new research center and pilot plants have been established at Montebello, California for the further development of processes for manufacturing of synthetic products from varied sources of supply. Semi-commercial scale pilot plants at Montebello, capable of producing 5,000 gallons of synthetic gasoline per day, are now operating.

Over-all costs of making gasoline by the new process are about one fourth that of the Fischer-Tropsch method. The new process has reduced costs to a point at which synthetic gasoline can be competitive with fuel made from petroleum by modern refinery procedures.

The process produces a gasoline with an octane rating of 80 and higher—as contrasted with the old process which gave products with a rating of 20 or lower and which required extensive processing before they were usable in internal combustion engines.

British Industries Fair: 1948

The second postwar British Industries Fair, the world's largest national trade fair, is to be held this year from May 3 to 14.

Allocations of space to more than 3,000 exhibits representing 87 different trades, has been completed, and arrangements planned for the comfort and convenience of overseas visitors.

Leather goods will be one of the main features of this year's Fair. The Leather, Footwear and Allied Industries Export Corporation, at the invitation of Britain's Board of Trade, are organizing a Leather Section at Earls' Court, London, as a special feature, just as the Textile Section was highlighted in 1947.

As in 1947, three big exhibition centers will be occupied by the British Industries Fair. Engineering industries will be represented at Castle Bromwich, in Birmingham; and the lighter industries at Earls' Court and Olympia in London.

Attractions at Earls' Court, besides leather goods, will include a large display of textiles and also plastics, pottery, glass and furniture. Olympia's halls will house among other things, the latest scientific and photographic goods.

New Resinox plant, completed by Monsanto Chemical Co.'s Plastics Division as part of an expansion program for production of phenolic plastics. The unit is located at Springfield, Mass.

USDA Exploits New Processes

Recent results of chemical investigations in the four Regional Research Laboratories and other units of the Bureau of Agricultural and Industrial Chemistry of the U.S. Department of Agriculture, are described in the 1947 annual report. Among the highlights:

Progress was made in making cotton fabrics resistant to penetration by water, and to damage by micro-organisms and sunlight, through chemical processing. A differential dyeing test for detecting immature cotton fibers in admixture with mature fibers was developed and used for selecting cottons of desired maturity.

The processing and preservation of fats and oils for food uses and the conversion of such materials into industrial nonfood products were advanced by research in three of the regional laboratories. Cottonseed meal was improved as a feed for poultry by substantial removal of the pigment glands, as well as the oil, from the kernels.

A new industrial application was made of soybean protein as an adhesive in the manufacturing of casings for shot-gun shells. Methods were developed for obtaining improved peanut meal and peanut protein suitable for the manufacture of synthetic fibers and for use as an adhesive in paper coatings and cold water paint. A continuous process was developed for making casein bristles.

Further progress was made in the conversion of starch and sugars into industrially useful derivatives through fermentation and chemical processing. A salt of aconitic acid, useful for making high grade transparent plastics, was recovered commercially from sugarcane molasses without reducing its sugar content.

New work undertaken during the year and covered by the 1947 report includes fundamental research on the movement and chemical action of a synthetic growth regulator in growing plants, on the submicroscopic structure of hide substance and leather, and on the chemical and immunochemical properties of allegrons in flaxseed.

Commercial Solvents Plants Research Expansion

Commercial Solvents Corp. plans an extensive expansion of the Research and Development Department at Terre Haute, Indiana. Two million dollars will be spent for new buildings and equipment. Plans have been approved and construction will begin shortly.

The program calls for more than doubling the size of the present research building, construction of a new bacteriological pilot plant unit, a separate building

for a high-pressure research pilot plant, and an addition to the pharmacological laboratory.

Curll to Manage Agricultural Division

Daniel B. Curll, Jr., now manager of the sales department, agricultural division, Commercial Solvents Corp. He was previously manager of the Dixie Chemical Division.

Cotton-for-Paper Program

The U. S. Department of Agriculture has resumed a program to encourage the use of low-grade cotton in the manufacture of paper.

Two cents a pound, gross weight, will be paid to "rag-content" paper manufacturers on cotton used within the provisions of the program in the manufacture of paper or in paper manufacturing processes. The maximum amount of cotton which can be used in this program is 10 million pounds. The proposed payment of two cents a pound is only half the rate under the Cotton-

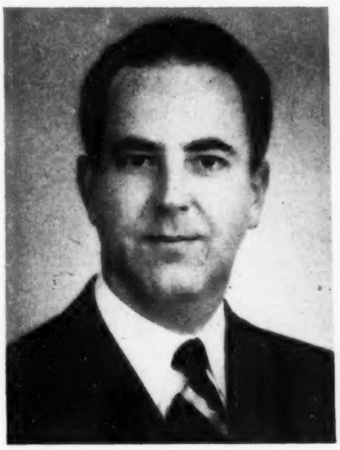
for-Paper Program that expired September 2, 1947. The quantity of cotton proposed for the fiscal year 1948 is only one-fifth, and the maximum expenditure only one-tenth of that under the previous Cotton-for-Paper program.

Chemicals Wanted

The following chemicals are wanted by the National Registry of Rare Chemicals, Armour Research Foundation, 33rd, Federal and Dearborn Sts., Chicago 16, Ill.:

3,3'-Dimethoxybenzidine-5,5'-disulfonic acid
4-Diethylamino-2-nitrosophenol
Hexahydrobenzaldehyde
4,5-Diamino-o-xylene
Piperonylacetonitrile
mono Perphthalic acid
Heneicosane
Eicosane
Glucamine
N-Vinylpyrrole
2-Hexenal
Sodium fluophosphate
Isocamphane
Camphenilone
Potassium aluminum borate
3-Amino-1,2,4-triazole
Catechol monophenyl ether
Stigmasterol
2,3-Dimethoxybenzyl dimethylamine
2,4-Dibenzyloxybenzaldehyde

Collins Joins Michigan Chemical



John Gordon Collins, appointed general sales manager, Michigan Chemical Corp. He has been vice-president and general sales manager for Amecco Chemicals.

Increased Ethyl Acetate Production

Substantial increase in production of ethyl acetate for foreign and domestic delivery at reasonable prices has been announced by Monsanto Chemical Co.

A byproduct of Monsanto's polyvinyl acetal operations at Springfield, Mass., ethyl acetate is refined at Merrimac headquarters in Everett. Ethyl alcohol is a product of New England Alcohol Co., a Monsanto subsidiary.

Production of ethyl acetate for foreign and domestic sale will be nearly doubled. The increase is due to the continued high demand for polyvinyl acetals for safety glass for automobiles and transparent coatings for fabrics.

Scarcity and the high price of molasses have brought about recent price increases

in fermentation ethyl acetate. Since Monsanto is able to manufacture this product as a result of its Springfield operations, however, there has been no change in the price scale.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, 33rd annual meeting, Netherlands Plaza Hotel, Cincinnati, May 23-28.
AMERICAN GAS ASSOCIATION, spring conference, Windsor, Ontario, Canada, April 7-9.
AMERICAN INSTITUTE OF CHEMISTS, annual meeting, Hotel Pennsylvania, N. Y., May 8.
AMERICAN MANAGEMENT ASSOCIATION, 17th annual packaging exposition, Public Auditorium, Cleveland, April 26-30.
AMERICAN OIL CHEMISTS' SOCIETY, 39th annual meeting, New Orleans, May 4-6.
ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC., Hotel Sheraton, N. Y., April 28.
FOREST PRODUCTS RESEARCH SOCIETY, annual meeting, American Furniture Mart Building, Chicago, March 22-24.
METAL POWDER ASSOCIATION, 4th annual spring meeting and exhibit, Drake Hotel, Chicago, April 15-16.
NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 4th annual conference and exhibition, Jefferson Hotel, St. Louis, April 5-8.
NATIONAL PETROLEUM ASSOCIATION, Cleveland Hotel, Cleveland, April 21-23.
PITTSBURGH INTERNATIONAL CONFERENCE ON SURFACE REACTIONS, Mellon Institute for Industrial Research, Pittsburgh, June 7-11.
SOCIETY OF COSMETIC CHEMISTS, Biltmore Hotel, N. Y., May 19.
SOCIETY OF THE PLASTICS INDUSTRY, second national plastics exposition, Coliseum, Chicago, May 6-10.
THIRD NATIONAL INSTRUMENT CONFERENCE AND EXHIBIT, Philadelphia Convention Hall, Sept. 13-17.

COMPANIES

Charles H. Phillips Co. Division of Sterling Drug Inc. has opened a drug manufacturing establishment in Gulfport, Miss. The new plant is to serve the South and South America.

Liquid Carbonic Corp. has purchased the Stuart Oxygen Co., producer of oxyacetylene gas for 100,000 shares of Liquid's common stock. W. A. Brown, Jr., vice-president of Liquid, has been made president of Stuart.

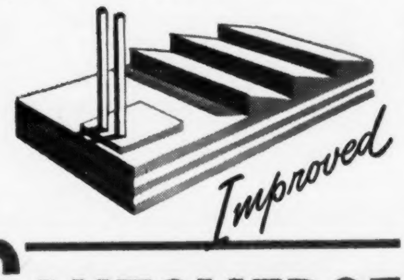
Paisley Products, Inc. of Illinois and Paisley Products, Inc. of New York, industrial adhesive manufacturing subsidiaries of Morningstar, Nicol, Inc. have been consolidated, and Murray Stempel has been elected vice-president and general manager of the consolidated operations.

The name of the Standard Oil Co. of New Jersey has been changed to the Esso Standard Oil Co.

The change was made because of the close association which has developed in the public's mind over a period of years between the corporate name of the company and its Esso trade-mark.

Koreon, the one-bath chrome tan which Rohm & Haas Co. has supplied to the tanning industry for the past thirty years, will in the future be sold directly by the Mutual Chemical Co. of America. Mutual has always been the sole American manufacturer of Koreon, but domestic sales have been handled exclusively through Rohm & Haas.

The firm of Herron Brothers and



industrial cleaning

SANTOMERSE No 1

household packaging

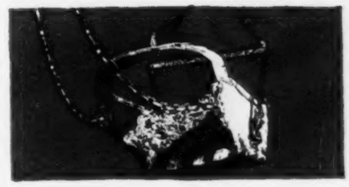
Santomerse No. 1 is truly the modern all-purpose synthetic detergent and wetting agent because it combines the following valuable properties: *wetting out, dispersing, emulsifying, penetrating and cleaning action.* Two dry, ready-to-use forms are available: the spray-dried bead form for household packaging (without further processing), the drum-dried flake form for all types of industrial cleaning.

Santomerse No. 1 is free-flowing and can be easily blended with other materials. It will dissolve quickly in cold or warm, hard or soft water — and can be used effectively at a pH of 1 or 12.

Newly enlarged production facilities for Santomerse No. 1 assure plentiful supplies of both flake and bead forms. For complete application and technical data send for Bulletin No. P-118, "Santomerse No. 1 . . . The Modern All-Purpose Detergent and Wetting Agent." MONSANTO CHEMICAL COMPANY, Phosphate Division, 1703 South Second Street, St. Louis 4, Missouri. *Santomerse: Reg. U. S. Pat. Off.*

QUICK FACTS ABOUT SANTOMERSE No. 1

1. Combines cleaning action, wetting, dispersing, emulsifying, penetrating — all in one product.
2. Speeds and improves cleaning by first making water wetter so that it spreads faster and penetrates deeper.
3. Quickly separates and removes imbedded or attached soil, breaks it up and keeps it in suspension so it cannot be re-deposited.
4. Functions effectively in hard or soft water . . . in acid or alkaline . . . hot or cold solutions.
5. Produces instant lather or foam in water solutions under all conditions.
6. Can be used alone or in combination with other materials such as alkaline builders.
7. Prevents formation of insoluble curds in hard water.



MONSANTO PHOSPHORUS

Monsanto, the world's largest commercial producer of phosphorus, offers this wide range of derivatives for use in food products, drugs and countless industrial processes. The interesting story of this vital element is told in Monsanto's book, "Phosphorus . . . The Light Bearer." Write for your copy, or ask for it on the coupon below.

Phosphorus (Yellow)
Phosphoric Acid
Phosphorus Pentoxide
Mono Sodium Phosphate
Di Sodium Phosphate
Tri Sodium Phosphate
Sodium Acid Pyrophosphate
Tetra Sodium Pyrophosphate
Mono Calcium Phosphate
Di Calcium Phosphate
Tri Calcium Phosphate
Calcium Pyrophosphate
Ferric Orthophosphate
Sodium Ferric Pyrophosphate
Mono Ammonium Phosphate
Di Ammonium Phosphate
Aluminum Phosphates
Potassium Phosphates
Magnesium Phosphates
Alkyl Acid Phosphates
Alkyl Alkali Phosphates
Ferro Phosphorus

MONSANTO CHEMICAL COMPANY, 1703 South Second St., St. Louis 4, Mo. District Sales Offices: New York, Philadelphia, Chicago, Boston, Detroit, Cleveland, Cincinnati, Charlotte, Birmingham, Houston, Akron, Los Angeles, San Francisco, Seattle. In Canada: Monsanto (Canada) Limited, Montreal.

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CHEMICALS – PLASTICS

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Please send me further information on the following products:______

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Company______

Address______

City______ State______

Meyer, suppliers of pigments to the rubber and other industries, recently was reorganized and incorporated under the name of HERRON BROS. & MEYER, INC. W. A. Herron, former chief in the New York office, has been elected president.

COMMERCIAL SOLVENTS CORP. has merged its New York and Boston district sales offices into the Metropolitan district office. R. L. Hutchins, formerly manager of the New York district office, has been appointed manager of the new office.

HEYDEN CHEMICAL CORP. has purchased the minority interest of the Borden Co. for an undisclosed sum and now owns more than 99 per cent of the stock of American Plastics Corp., Bainbridge, N. Y. Simon Askin, assistant secretary and assistant treasurer of Heyden, is the new president of American Plastics. He succeeds William F. Leicester, of the Borden Co.

Penn Salt Names McWhirter

James McWhirter, appointed superintendent of Pennsylvania Salt Co.'s fluorine chemical plant near Paducah, Ky. He was formerly superintendent of Penn Salt's Natrona plant.

SAMUEL P. SADTLER & SON, INC., has opened its enlarged laboratories at 2100 Arch Street, Philadelphia.

B. F. GOODRICH CHEMICAL CO., Cleveland, will construct a new $3 million general chemical plant in Avon Lake, Ohio. The new plant will be located on the tract owned by the company in Avon Lake, where its chemical experimental station is already located. Various general chemical products now in the development or semicommercial stage will be produced.

CARBIDE AND CARBON CHEMICALS CORP. has opened a sales office in Atlanta, Georgia, at 44 Broad Street, N.W. Ray G. Kelso has been appointed district manager for the Atlanta area.

MONSANTO CHEMICAL CO. has formed a senior technologists group in the Process Section, General Engineering Department. The new group, established to provide specialized technical aid to all divisions and departments of the company, will be directed by J. M. Graham, Jr.

Construction has started on a new modern brick single-story warehouse and office in Dallas, Texas, for WINTHROP-STEARNS INC., manufacturer of pharmaceutical preparations. Territory to be served in-

cludes all of Texas, Oklahoma, Arkansas, New Mexico, and a portion of Louisiana.

Swift Appoints Dudycha

H. E. Dudycha, made operations superintendent of the industrial oil unit of Swift & Co.'s Hammond, Ind., plant. He has been assistant superintendent of the company's St. Louis plant.

CANADA

Dominion's Plastics Output Grows Rapidly

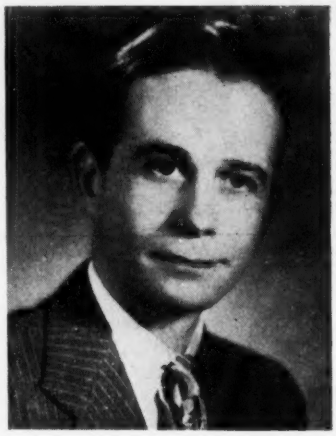
Back in 1931 the Canadian plastics industry consisted of one $1 million unit and by 1939 capital invested in resin facilities totaled only about $4.5 million. By last year, however, resin makers had invested more than $30 million in plants and equipment and employed 12,000 men.

Output of resins had burgeoned too. It was not until 1939 that the dollar value of production exceeded a million dollars. Since then it increased many fold, and the odds are that this year will witness a phenomenal growth in the stature of the industry.

At the moment, for instance, Canadian Resins & Chemicals, Ltd., is completing an addition to its vinyl chloride-vinyl acetate facilities, Monsanto Chemical Co. has brought in its first polystyrene unit at Montreal. Dow Chemical Co. is likewise scheduling early production of polystrene at Sarnia. In addition, Bakelite Corp. is building a new plant at Belleville, Ont.

These are but a few of the recent developments, developments which will augment the Dominion's stature as a resin producer. Too, all the output will not be devoted to domestic consumers for more and more attention is being paid to Empire export markets.

U. S. Electrical Motors Names Mason



Frank M. Mason, named vice-president in charge of U. S. Electrical Motors' Atlantic plant. His headquarters will be at Milford, Conn.

PERSONNEL

Company Officers

M. B. Chittick and Fred B. Loeffler have joined the American Mineral Spirits Co., Col. Chittick to form a new department for the handling of petroleum resins and Mr. Loeffler as assistant to the president.

Thomas W. Cox has been appointed assistant secretary of Pennsylvania Salt Mfg. Co., succeeding U. Grant Beath. He is also assistant treasurer of the company.

Hugh Burdette, vice-president of the Cabot Carbon Co., has been elected president of the Texas Elf Carbon Co., partly owned Cabot subsidiary for the production of carbon black, and E. L. Green, Jr., head of the natural gas and gasoline department of Cabot Carbon, has been elected a vice-president of that company.

Edgar W. Harris, director of sales, Darco Corp., has been elected a member of the board of directors. He started with Darco in 1931.

William F. Mitchell, superintendent of Pennsalt's Wyandotte, Mich., plant for the past three years, has been named assistant vice president. He joined the firm in 1936 as an engineer in the technical service division, at Philadelphia.

M. A. Self has been elected vice president in charge of sales and a director of the Bee Chemical Co. He has been sales manager of the company since 1947.

Production

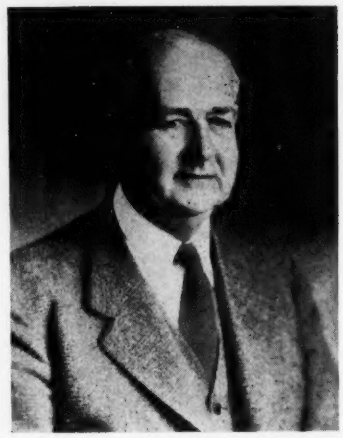
Thomas W. Harris, Jr. has been named director of purchases for Du Pont. He has been purchasing agent since 1945.

John P. Edwards has recently been promoted to the sales development department of the Hooker Electrochemical Co. He will handle technical correspondence with respect to the use and application of Hooker chemicals by all customers.

F. B. JEWETT, JR., formerly vice-president of the National Research Corp., Boston, has been named director of business administration for the Research Laboratories of General Mills, Inc., Minneapolis, Minnesota. He will administer plant engineering, service and accounting functions for General Mills' entire research operation.

AFTON D. PUCKETT has joined the Du Pont Co.'s Petroleum Chemicals Division. He has been put in charge of operations of all anti-knock equipment in connection with Du Pont's entry into the direct marketing of tetraethyl lead compounds.

Innis, Speiden Promotes Ladd



E. T. Ladd, made works manager of the Isco Chemical Division, Innis, Speiden & Co. He succeeds Eben C. Speiden, now retired.

HAROLD B. GARRETT has been appointed assistant director of purchases of the Du Pont Co. He succeeds THOMAS W. HARRIS, JR., who is now director of purchases.

S. A. SIEGEL, chief chemist of the Lever Brothers Co., Hammond Plant since 1930, has been transferred to its Cambridge, Massachusetts plant, and now has a position in the control division.

Cosmetic chemist and consultant Harry Hilfer has been chosen to represent the EMULSOL CORP. in its promotional activities in the New York and eastern New Jersey area.

Research

GEORGE RIEGER has joined the research department of Hercules Powder Co. as technical assistant to the director of research. His efforts will be directed largely toward the coordination and stimulation of research efforts on new applications for Hercules products.

ERLA WILHELM and JEROME A. PLATTE have joined the laboratory staff of Hall Laboratories, Pittsburgh.

VICTOR H. SCHOFFELMAYER has accepted appointment to the staff of Southwest Research Institute of San Antonio and Houston. He was previously science editor of the *Dallas Morning News.*

CHARLES G. DRYER has been appointed manager of Tennessee Eastman Corpora-

tion's research laboratories at Kingsport, Tennessee, and JOSEPH B. DICKEY has been made associate director of research in charge of Tennessee Eastman products division of the Kodak Research Laboratories in Rochester, New York.

ROBERT Q. WILSON has been appointed to the staff of Battelle Institute, Columbus, Ohio, where he will engage in chemical engineering research. He served formerly as a research assistant at the Ohio State University Research Foundation.

MILTON J. SCOTT has been appointed assistant director of research for Monsanto Chemical Co.'s Merrimac division. A research chemist or group leader at Monsanto's Plastics Division in Springfield since 1942, Scott will direct and supervise textile research and application at Merrimac headquarters in Everett.

St. Joseph Lead Appoints Outcault

Harry E. Outcault, named manager, zinc oxide sales, St. Joseph Lead Co. He has been associated with the company since 1931.

HERMAN A. BRUSON has joined the Industrial Rayon Corp., Cleveland, Ohio, as head of the high polymer research division.

DOCTOR AND MRS. Y. P. SUN, research entomologists of Cornell, have joined the staff of Julius Hyman & Co., Denver, Colorado, where they will continue work in the study of basic entomology and insecticidal problems.

DICRAN A. BERBERIAN, M. D., formerly chairman of the department of bacteriology and parasitology at the American University of Beirut, Lebanon, is now a senior investigator in the department of chemotherapy of the Sterling-Winthrop Research Institute, Rensselaer, N. Y.

Sales

HERBERT W. MCMULLEN has joined the P.W.R. Export Corp. as an export sales representative. P.W.R. is the foreign sales subsidiary of Merck & Co., Inc., Rahway, N. J.

G. V. SLOTTMAN, formerly manager, technical sales division has been appointed technical assistant to the vice president, Air Reduction Sales Co., and SCOTT D. BAUMER, formerly assistant manager, technical sales division has been appointed manager of that division.

CHEMICAL SPECIALTIES

A department devoted to news of the chemical specialties field. Descriptions of new specialty products will be found in the New Products & Processes department.

New Agricultural Chemical Company

A new affiliate for the sale of basic agricultural chemicals was announced today by Pittsburgh Coke & Chemical Company of Pittsburgh, Pa. The new organization will be known as Pittsburgh Agricultural Chemical Company and will have executive offices on the 65th floor of the Empire State Building, New York City.

W. J. Haude, formerly vice-president and sales manager of John Powell & Co., Inc., has been named president of the new company. Dr. Joseph B. Skaptason, former director of technical sales for Powell, will be vice-president in charge of sales and development.

Sales offices in a number of the principal cities of the U. S. and Canada are planned by the new company. While its basic agricultural chemicals will be manufactured in the company's own plant at Neville Island, Pittsburgh, the new affiliate also will handle other products to round out a line of insecticides, fungicides, rodenticides, disinfectants, plant hormones and other agricultural chemicals.

In addition to present production facilities, Pittsburgh Coke & Chemical Company is undertaking an expansion program of over $2,000,000 to continue its chemical development, a large part of which will be devoted to agricultural chemicals.

Among the agricultural chemicals which the new company will market are benzene hexachloride, organic phosphate insecticides, cotton defoliant, quaternary ammonium compounds, general purpose weed killers, estrogen compounds for poultry, methylated naphthalene solvents and sodium thiocyanate derivatives.

The new company has been formed primarily to answer a need for a basic coal tar producer to enter the agricultural chemical field with a broad program. A coordinated program of chemical research, biological testing, product development, field testing and technical sales service already has been set up.

Control Peach Tree Borer with DDT

Recent experiments have resulted in a new use for the versatile insecticide, DDT. Insect specialists have found that when used in trunk sprays, this material is very effective in controlling the peach tree borer.

The borer is an important pest of peach trees, often causing severe damage. Larvae of the insect bore right through the bark around the trunk, and then eat out the growing layer of the tree.

According to A. A. LaPlante of the N. Y. Agricultural Experiment Station at Geneva, the DDT is used at the rate of 2 pounds of a 50% wettable powder to each 100 gallons. Research has shown that three sprays at three-week intervals have been most effective. The first one is applied about the 2nd week of July, but this will vary with the season.

As an example of control obtained with DDT this past season, there were 90 borers found in ten test trees where no treatments were made, but only 3 borers in ten trees that had been sprayed.

Joseph B. Skaptson (left) and W. J. Haude, new officials of the Pittsburgh Agricultural Co.

BONE BLACK

- All standard grists for industries refining sugar, corn syrup, and mineral oils.
- Fine grades suitable for pigment industry and special applications.
- This high quality product that meets your most exacting requirements is the result of 66 years of experience and progress.
- Your inquiries will receive prompt attention.

CONSOLIDATED CHEMICAL INDUSTRIES INC.

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OR 530 FIFTH AVENUE, NEW YORK 20, N. Y.

FAIRMOUNT CHEMICALS

- **HYDRAZINE BASE 93-95%**
- **HYDRAZINE HYDRATE 85% 100%**
- **HYDRAZINE SULFATE** Commercial and C.P.
  Use: Manufacture of intermediates for dyes and pharmaceuticals. Hydrazine Base has solvent properties similar to liquid ammonia.
- **SEMICARBAZIDE BASE**
- **SEMICARBAZIDE HYDROCHLORIDE** Commercial and C.P.
  Use: Isolation of ketones and aldehydes, forming well-defined crystalline compounds.
- **SODIUM AZIDE**
- **SODIUM CYANATE**
- **PARA DIAZODIMETHYLANILINE**
- **PARA DIAZODIETHYLANILINE**
  Use: The stabilized salts are used in light-sensitive diazo-type coatings.

FAIRMOUNT
CHEMICAL CO., INC.

MAIN OFFICE: 600 Ferry Street, Newark 5, N. J.
SALES OFFICE: 136 Liberty Street, New York 5, N. Y.

FINE AROMATIC CHEMICALS ESSENTIAL OILS and COMPOUNDS

Aromatics Division
GENERAL DRUG COMPANY

644 Pacific Street, Brooklyn 17, N. Y.
9 S. Clinton Street, Chicago 6
1019 Elliott Street, W., Windsor, Ont.

ESTABLISHED 1910 · GD · AROMATICS DIVISION

Oil Technology Course

The first short course in fat and oil technology ever offered by the American Oil Chemists' Society will be given on August 16-21, 1948, at Urbana, Ill., in cooperation with the University of Illinois, according to an announcement in the February issue of the Journal of the American Oil Chemists' Society. J. P. Harris, West Virginia Pulp and Paper Company, is chairman of a special education committee to handle arrangements.

Emphasis will be placed on the technology of edible vegetable oils for this first course, and enrollment will be limited to a selected 50. Certificates will be granted at the end of the short course. Field trips to nearby plants will be a feature of the week's program, which will also include 20 lectures by authorities in vegetable oil production, marketing, processing, and utilization. Registration fee will be $10, and the Inman Hotel in Champaign will serve as lodgings.

New Varnish Protects Fishing Rods

Designed primarily for protecting and preserving bamboo or metal fishing rods. Devoe & Raynolds is introducing Izaak Walton Varnish, a synthetic varnish so elastic that it is not affected by the stresses and strains that a fishing rod must withstand.

Unusual, in the fact that it will not turn white in fresh or salt water, it also resists temperature changes, fly oil, line grease and insect repellents, according to the maker.

Ziegler Names Kraaz

Heinz W. Kraaz, appointed manager of the Wax Division, G. S. Ziegler and Co. He was until recently vice-president of the Wax and Oil Division, Allied Asphalt & Mineral Corp.

Anti-Fogging Agent for Windows and Glasses

Fogging of car windows and eye glasses has long been a safety hazard. Defrosters have largely solved the major windshield problem, but side windows and glasses remained. Now Du Pont's fine chemicals division has developed an effective anti-fogging agent.

Its effectiveness was demonstrated by testing on safety goggles worn in factory steamrooms, on car windows, and in other ways. Each application lasts several hours, and is applied merely by wiping the glass with an impregnated cloth.

Some 200 yards of diaper cloth was treated at the Du Pont technical laboratory with a solution having the following composition:

Du Pont's "Duponol" ME Dry fatty alcohol sulfate	700 grams
Tannic acid	90 grams
Glycerine	160 grams
"Pontamine" Sky Blue 6BX Conc. 150%	9 grams
Water sufficient to make 8 liters	

"Duponol" ME Dry is a synthetic detergent or so-called "soapless soap" and is used in the formula to insure that moisture which condenses on the cold glass is uniformly spread over the surface as a clear film. The dye is to give the solution a distinctive color—and any color can be used—for quick identification and to prevent use of the solution by mistake.

The cloth is padded in the solution at room temperature. No pressure is put on the pad rolls during this operation. The cloth is dried on large steam cans, after which it is ready for use.

The Du Pont formula has not been patented, and is available to manufacturers who wish to market cloth treated with this anti-fogging agent.

CHEMICAL MARKETS

Casein Output Boosted

Production of dry casein in October was the highest of any October on record since 1941, but manufacturers' stocks at the end of the month were the lowest on record of that date, the Bureau of Agricultural Economics reported recently.

Estimated production of dry casein for October was 1,750,000 pounds, a gain of 58 per cent from a year earlier and 33 per cent above the 5-year October average. During the first ten months of 1947, production totaled 29,583,000 pounds, an increase of 104 per cent from the corresponding period in 1946 and 17 per cent from the first ten months' average for 1941-45.

Naval Stores Continue Upward Trend

Gum turpentine production for the six months ending September 30, 1947, was 197,090 barrels (50 gallons) or 10 per cent above production for the same period of last year, according to the Bureau of Agricultural Economics. Wood turpentine production for the first half of the current naval stores year amounted to 168,688 barrels, 26 per cent above production for the corresponding six months of 1946.

Of the total wood turpentine production during the first half of the current naval stores year, steam distilled accounted for 99,612 barrels; sulphate, 66,805; and destructively distilled, 2,271 barrels. For the six months ending September 30, 1946, steam distilled turpentine totaled 72,853 barrels; sulphate, 59,045; and destructively distilled, 2,257 barrels.

Gum stills produced 523,758 drums (520 pounds net) of rosin during the first half of the year. Reclaimed rosin for this period amounted to 2,488 drums making a total gum rosin out-turn of 526,246 drums compared with 469,195 drums during the corresponding period of 1946.

Steam distilled rosin for the six-month period ending September 30, 1947, amounted to 573,322 drums, 31 per cent above the production for the same period in 1946. The combined production of gum and wood rosin for the first half of the 1947-48 fiscal year was approximately 1,100,000 drums, compared with 900,000 drums for this period last year.

Shipments of Two Major Plastics Down

With only a few exceptions, shipments and consumption of plastics dropped in November from the previous month, according to the Bureau of the Census.

Phenolic and other tar acid resins, for instance, dropped from 17,886,441 pounds to 15,410,000 pounds. Polystyrene shipments likewise dipped from 10,930,000 pounds to 10,593,000 pounds.

Nevertheless, urea and melamine resins and vinyl sheeting registered gains.

Inorganic Production Declines Slightly

Production of inorganic chemicals dropped slightly in November from the previous month but generally remained above November, 1946.

The decline from October, which occurred in 20 of the 35 inorganic chemicals covered by the census was ascribed by officials to the fewer number of working days in November.

Only nine of the thirty-five inorganics were produced in smaller quantity in November, 1947, than in the previous November.

Outstanding production increases were registered for hydrogen and nitric acid, with the latter rising to a record monthly high of 67,996 short tons.

Chemicals produced in lesser volume in November than October include the ammonia compounds, calcium phosphates, phosphoric acid, tetrasodium phosphate, chrome colors and chemicals, Glaubers' salt, chlorine, soda ash, caustic soda and sulfuric acid.

Of these, only synthetic ammonium sulfate and the calcium phosphates also saw a drop from November 1946. Production also dropped below the previous November for calcium carbide, chrome green, lead arsenate, silver nitrate and sodium bicarbonate.

Oil Crushings Suffer Serious Cutback

Cottonseed crushings at oil mills in the United States for the season ending July 31, 1947, were the lowest on record since the season ending July, 1922, according to the Bureau of the Census. The quantity crushed during the 1946-47 season was 3,089,590 tons, compared with 3,261,-915 tons for the previous season and 3,007,717 tons for 1921-22 season. The average crush for the past ten seasons was 4,241,000 tons. The record low crushings for the past two seasons reflect the correspondingly small cotton crops of 1945 and 1946.

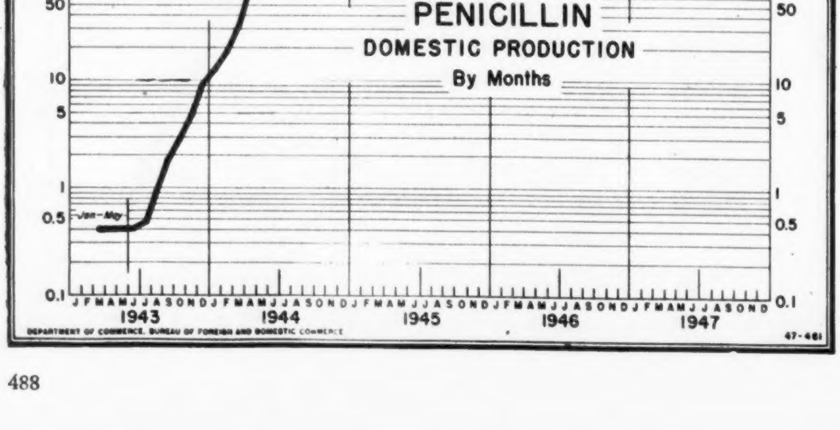
Production of crude cottonseed oil amounted to 973 million pounds, 4 per cent less than the 1,018 million pounds reported for the previous season. Stocks of crude oil reported held during the season were generally lower than those held during the past several seasons, the "carry-over" on July 31, 1947, amounting to only 15 million pounds.

Refined cottonseed oil production during 1946-47 totaled 912 million pounds, 4 per cent less than the 952 million pounds produced during 1945-46. Stocks at the end of the season, July 31, 1947, amounted to 171 million pounds, 35 per cent less than the 263 million pounds reported held at the end of the previous season.

Water-Thinned Paint Sales Pared

Manufacturers' sales of water-thinned paints decreased in November compared with October due in part to fewer working days, according to the Bureau of the Census, Department of Commerce. Total sales of all types of water-thinned paints amounted to $1,881,320, while in the previous month sales were $2,187,476.

Cold-water paints sales showed the greatest drop in the 2 month comparison,



dropping from \$735,635 in October to \$565,506 in November. In November 1946, sales of this type totaled \$790,737. Resin emulsion paints sales recorded for the month were \$1,015,359 against \$1,-156,528 for the previous period.

Sales of plastic-texture water paints amounted to \$215,787 and \$217,829 in the earlier month, but were well above the last November's total of \$146,735.

Calcimines sales in these months were: November 1947, \$84,668; October 1947, \$77,484; and November 1946, \$66,592.

Tin to Continue Tight For Two Years

In the fifth year of a world-wide tin shortage, 1946, total world output rose only 6 per cent from the long-time low of the preceding year to 89,000 long tons according to the Bureau of Mines. World consumption of the order of 115,000 tons was made possible by drafts on stocks of the United States and the United Kingdom through the agency of the Combined Tin Committee.

Slow progress in rehabilitation in the Far East accompanied by unsettled political conditions there and in Bolivia were the principal factors in retarded expansion of production. World requirements for tin probably will not be satisfied until 1949.

There was no domestic mine production but smelters set a new record at 43,500 long tons of metal.

Domestic tin consumers reported net receipts of 85,153 long tons of tin in 1946, or 1 per cent less than in 1945. Two-thirds or 56,603 tons (54,663 in 1945) was primarily pig tin, and the rest was in scrap, secondary pig tin and terne metal.

Vegetable Oils Stage Price Comeback

Major purchasers of vegetable oils are always faced with real problems: when to buy, when to build inventories, when to let stocks run down and take a chance that prices will dip. And this year their problem is even more acute.

One such complication is, of course, the effects which the Marshall Plan will have on the supply-demand balance, and consequently on price levels. In addition, buyers are trying to estimate what effect current high prices will have on the size of the domestic market.

Last month prices edged close to the record levels which were established last spring, and large volume users were acting cautiously about long-term commitments. Demand for spot and nearby oil continued to be heavy, however, indicating a willingness to replenish depleted inventories. Obvious, nevertheless, was the feeling that a price break might be in the offing and it was hardly shrewd business to overstock.

At the moment, the odds are that quotations will hold, at least for a few months.

CURRENT PRICES

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f.o.b. works are specified as such. Import chemicals are so designated.

Oils are quoted spot New York, ex-dock. Quotations f.o.b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f.o.b., or ex-dock. Materials sold f.o.b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both.

Purchasing Power of the Dollar: 1926 Average—$1.00
February, 1946, $0.767 February, 1947, $0.601
February, 1948, $0.581

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Acetaldehyde, 99%, drs wks..lb.	.11	.12	.11	.12	.11	.15
Acetic Anhydride, drs, c.l., frt. all. E....lb.	.13	.14½	.13	.14½	.11½	.14½
Acetone, tks, delv....lb.	.07	.09	.07	.09	.07	.09
ACIDS						
Acetic, 28% bbls....100 lbs.	3.78	4.08	3.78	4.08	3.38	4.08
Glacial, synthetic, C. P., drs, wks....100 lbs.	13.50	14.00	13.50	14.00	13.50	14.00
Acetylsalicylic, Standard USP....lb.	.45	.59	.45	.59	.45	.59
Benzoic, tech, bbls....lb.	.43	.47	.43	.47	.43	.47
USP, bbls, 4,000 lbs. up....lb.	....	.54	....	.54	....	.54
Boric tech, bbls, c-l, frt. split....tons	....	124.00	....	124.00	....	124.00
Chlorosulfonic, drs, wks....lb.	.03	.04½	.03	.04½	.03	.04½
Citric, USP, crys, gran, bbls....lb. *b*	.22	.23	.22	.23	.20	.23
Cresylic 50%, 210-215° low boil 50%, drs, wks, frt, equal....gal.	1.26	1.48	1.26	1.48	1.01	1.26
Formic, 85%-90% cbys....lb.	.12	.14½	.12	.14½	.10	14½
Hydrofluoric, 30% steel, drs....lbs.	.08	.09	.08	.09	.08	.09
Lactic, 22%, bbls, c.l., wks, 100....lb.	....	4.40	....	4.40	....	4.40
44%, light, bbls, wks....lb.	8.15	8.55	8.15	8.55	.07	.55
Maleic, Anhydride, drs....lb.	.25	.26	.25	.26	.25	.26
Muriatic 18° cbys....100 lbs.	1.50	2.90	1.50	2.90	1.50	2.90
20° cbys, c-l, wks....100 lbs.	1.85	2.00	1.85	2.00	1.85	2.00
22° cbys, c-l, wks....100 lbs.	2.35	2.50	2.35	2.50	2.35	2.50
Nitric, 36°, cbys, wks..100 lbs. *c*	5.00	6.30	5.00	6.30	5.00	6.30
38°, c-l, cbys, wks...100 lbs. *c*	2.35	5.50	2.35	5.50	....	5.50
40°, c-l, cbys, wks...100 lbs. *c*	6.00	6.50	6.00	6.50	....	6.50
42°, c-l, cbys, wks...100 lbs. *c*	6.50	7.00	6.50	7.00	....	7.00
Oxalic, bbls, wks....lb.	.13	.14	.13	.14	.11¾	.14
Phosphoric, 100 lb. cbys, USP....lb.	.10½	.13	.10½	.13	.10½	.13
Salicyclic tech, bbls....lb.	.31	.38	.31	.38	.26	.42
Sulfuric, 60°, tks, wks....ton	12.25	13.50	12.25	13.50	....	13.50
66°, tks, wks....ton	15.00	17.50	15.00	17.50	....	17.50
Fuming 20% tks, wks....ton	19.50	20.50	19.50	20.50	....	20.50
Tartaric, USP, bbls....lb.	.45½	.50	.45½	.50	.49½	.55
Alcohol, Amyl (from Pentane) tks, delv....lb.	....	.25	....	.25	....	.25
Butyl, normal, syn, tks...lb.	....	.17	....	.17	....	.17
Denatured, CD, proprietary solvent....gal. *d*	1.00½	1.03	1.00½	1.03	1.00½	1.03
Ethyl, 190 proof tks....gal.	18.04	18.13	18.04	18.13	18.04	18.08
Isobutyl, ref'd, drs....lb.	....	.13	....	.13	....	.13
Isopropyl ref'd, 91% dms....gal.	.44	.50½	.44	.50½	.41	.50½
Alum, ammonia, lump, bbls, wks....100 lbs.	....	4.25	....	4.25	....	4.25
Aluminum, 98.99%....100 lbs.	15.00	16.00	15.00	16.00	15.00	16.00
Chloride anhyd, l.c.l. wks..lb.	....	.10¼	....	.10¼	....	.10¼
Hydrate, light, bgs....lb.	....	.17	....	.17	....	.17
Sulfate, com'l. bgs, wks, c-l....100 lbs.	1.15	1.30	1.15	1.30	1.15	1.30
Sulfate, iron-free, bgs, wks ....100 lbs.	1.95	2.25	1.95	2.25	1.75	2.50
Ammonia anhyd. cyl....lb.	.16	....	.16	....	.14½	.20
Ammonia, anhyd, fert, tank cars, wks, frt, equalized...ton	....	59.00	....	59.00	....	59.00
Ammonium Carbonate, USP, lumps, drs....lb.	.08¼	.19	.08¼	.19	.08¼	.19
Chloride, USP bbls, drms, kgs....lb.	.13	.15	.13	.15	.13	.15
Nitrate, tech, bgs, wks....lb.	.0435	.0450	.0435	.0450	.0435	.0450
Oxalate pure, grn, bbls....lb.	.23	.29	.23	.29	.23	.29
Perchlorate, kgs....lb.	.25	....	.25	....	.24	.25
Phosphate, dibasic tech, bgs....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Stearate, anyd, drs....lb.	....	.34	....	.34	....	.34
Sulfate, drs, bulk....ton	30.00	40.00	30.00	40.00	30.00	38.00

USP $25 higher; Prices are f.o.b. N. Y., Chicago, St. Louis, deliveries ½c higher than NYC prices. *a* Powdered boric acid $5 a ton higher; *b* Powdered citric acid is ½c higher; *c* Yellow grades 25c per 100 lbs. less in each case; *d* Prices given are Eastern schedule.

Current Prices **Amyl Acetate Gums**

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Amyl Acetate (from pentane) tks, delv....lb.	.21	.29	.21	.29	.21	.24
Aniline, Oil, drs....lb.	.13	.15	.13	.15	.12	.14
Anthraquinone, sub, bbls....lb.	....	.70	....	.70	....	.70
Antimony Oxide, bgs....lb.	.26	.27½	.26	.27½	.21	.31
Arsenic, whl, bbls, powd....lb.	.06	.08	.06	.08	.05	.08
Barium Carbonate precip, wks, bgs....ton	67.50	82.00	67.50	82.00	60.00	82.00
Chloride, tech, cryst, bgs, zone 1....ton	85.00	95.00	85.00	95.00	73.00	95.00
Barytes, floated, paper bgs..ton	no prices		no prices		....	41.95
Bauxite, bulk mines....ton	8.50	10.00	8.50	10.00	7.00	10.00
Benzaldehyde, tech, cbys, drs.lb.	.45	.55	.45	.55	.45	.55
Benzene (Benzol), 90%, tks, frt all'd....gal.	.19	.21	.19	.21	.19	.21
Benzyl Chloride, cbys....lb.	.20	.28	.20	.28	.20	.28
Beta-Naphthol, tech, bbls, wks....lb.	.23	.29	.23	.29	.21	.29
Bismuth metal, ton lots....lb.	....	2.00	....	2.00	....	2.00
Blanc Fixe, 66⅔% Pulp, bbls, wks....ton	55.00	65.00	55.00	65.00	40.00	60.00
Bleaching Powder, wks. 100 lbs.	2.75	3.75	2.75	3.75	2.50	3.75
Borax, tech, c-l, bgs....ton	53.50	56.00	53.50	56.00	45.00	56.00
Bordeaux Mixture, bgs....lb.	.15	.23	.15	.23	.11	.23
Bromine, cases....lb.	.21	.23	.21	.23	.21	.23
Butyl, acetate, norm, drs....lb.	.30½	.36½	.30½	.36½	.26	.33½
Cadmium Metal....lb.	1.75	1.80	1.75	1.80	....	1.80
Calcium, Acetate, bgs..100 lbs.	3.00	4.00	3.00	4.00	3.00	4.00
Carbide, drs....ton	50.00	90.00	50.00	90.00	50.00	90.00
Chloride, flake, bgs, c-l...ton	21.50	38.00	21.50	38.00	18.50	38.00
Solid, 73-75% drs, c-l....ton	20.00	37.50	20.00	37.50	18.00	37.50
Gluconate, USP, bbls....lb.	.58	.65	.58	.65	.57	.65
Phosphate tri, bbls, c-l....lb.	6.50	6.80	6.50	6.80	6.50	6.80
Camphor, USP, gran, powd, bbls, 2,000-lb. lots....lb.	.66	.78	.66	.78	.75	.82
Carbon Bisulfide, 55-gal. drs.lb.	.05	.05¾	.05	.05¾	.05	.05¾
Dioxide, cyl....lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, Zone 1, 52½ gal. drs....lb.	.06½	.07	.06½	.07	.06	.07
Casein, Acid Precip, bgs, 10,000 lbs. or more....lb.	.30	.35	.30	.35	.26	.35
Chlorine, cyls, lcl, wks, contract....lb.	.09	.15½	.09	.15½	.08¾	.10½
Liq, tk, wks, contract. 100 lbs.	....	2.25	....	2.25	....	2.30
Chloroform, tech, drs....lb.	.20	.23	.20	.23	.20	.23
Coal tar, wks, crude, dms, c-l, wks....dm.	....	10.60	....	10.60	....	10.60
Cobalt, Acetate, bbl....lb.	....	.83¾	....	.83¾	....	.83¾
Oxide, black kgs....lb.	1.275	1.80	1.275	1.80	....	1.30
Copper, metal....100 lbs.	....	21.50	....	21.50	21.50	24.00
Carbonate, 52-54%, bbls..lb.	.24	.26	.24	.26	.19½	.26½
Sulfate, bgs, wks cryst. ....100 lbs.	7.60	8.00	7.60	8.00	7.10	8.60
Copperas, bulk, c-l, wks....ton	....	14.00	....	14.00	....	14.00
Cresol, USP, drs....lb.	.14	.17¼	.14	.17¼	.13¾	.15¾
Dibutylamine, c-l, drs, wks...lb.	.52½	.76	.52½	.76	....	.76
Dibutylphthalate, drs....lb.	.32	.38½	.32	.38½	.29	.38½
Diethylaniline, drs....lb.	....	.48	....	.48	....	.48
Diethyleneglycol, drs, wks...lb.	.14	.15	.14	.15	.14	.15
Dimethylaniline, drs, cl., lcl..lb.	.21	.24¼	.21	.24¼	.20	.24¼
Dimethylphthalate, drs....lb.	.23½	.27½	.23½	.27½	.20	.24¾
Dinitrobenzene bbls....lb.	....	.16	....	.16	....	.16
Dinitrochlorobenzene, dms..lb.	.14	.15½	.14	.15½	.14	.15½
Dinitrophenol, bbls....lb.	....	.26¾	....	.26¾	....	.22
Dinitrotoluene, refd., drs....lb.	....	.18	....	.18	....	.18
Diphenyl, bbls, lcl, wks....lb.	.15	.20	.15	.20	.15	.20
Diphenylamine bbls....lb.	....	.25	....	.25	....	.25
Diphenylguanidine, drs....lb.	.35	.37	.35	.37	.35	.37
Ethyl Acetate syn. 85-90%, tks, frt. all'd....lb.	.09½	.13½	.09½	.13½	.09½	.12
Chloride, USP, bbls....lb.	.20	.22	.20	.22	.18	.22
Ethylene Dichloride, lcl, wks, E. Rockies, drs....lb.	.08½	.09½	.08½	.09½	.08½	.09½
Glycol, dms, cl....lb.	....	.13½	....	.13½	....	.12
Fluorspar, No. 1, grd. 95-98% bulk, c-l mines....ton	....	37.00	....	37.00	....	37.00
Formaldehyde, bbls, cl & lcl..lb.	.0645	.0745	.0645	.0745	.0520	.0745
Furfural tech, tks....lb.	....	.09½	....	.09½	....	.13
Fusel Oil, ref'd. drs, dlvd....lb.	.26½	.29½	.26½	.29½	.18½	.29½
Glauber's Salt, Cryst, bgs, wks....100 lbs.	1.25	1.75	1.25	1.75	1.05	1.75
Glycerine dynamite, drs, c-l..lb.	.39½	.40¼	.39½	.40¼	.29½	.75¾
Crude Saponification, 88% to refiners tks....lb.	.23	.32	.23	.32	.23	.60

GUMS

Gum Arabic, amber sorts bgs.lb.	.14	.15	.14	.15	.13¾	.15
Benzoin, Sumatra, cs....lb.	.50	.60	.50	.60	.50	1.00
Copal, Congo No. 1, bgs....lb.	.26	.29	.26	.29	.26	.29
Copal, East India, chips....lb.	no prices		no prices		no prices	
Macassar DBB, bgs....lb.	.24	.25	.24	.25	.24	.25
Copal Manila....lb.	no prices		no prices		.25	....
Karaya, bbls, bxs, drs....lb.	.20	.51	.20	.51	.20	.55

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys: cbys; carlots, c-l; less than carlots, lcl; drums, drs; kegs, kgs; powdered, powd refined, ref'd; tanks, tks; works, f.o.b., wks.

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Kauri, N. Y.						
Superior Pale XXX......lb.	no prices		no prices		....	nom.
bgs....................lb.		.31		.31	....	.31
Sandarac, cks..............lb.	.95	1.50	.95	1.50	.85	1.00
Tragacanth, No. 1, cases....lb.	3.60	8.70	3.60	8.70	3.60	8.70
No. 3..................lb.	2.00	2.50	2.00	2.50	2.00	3.45
Yacca, bgs..................lb.	.06	.07	.06	.07	.06	.07
Hydrogen Peroxide, cbys....lb.	.15½	.18½	.15½	.18½	.15½	.18½
Iodine, Resublimed, jars....lb.	2.35	2.65	2.35	2.65	....	2.65
Lead Acetate, cryst, bbls....lb.	....	.19¼	....	.19¼	....	.19¼
Arsenate basic, bg, lcl.....lb.	.22¾	.23¾	.22¾	.23¾	....	.23¾
Nitrate, bbls..............lb.	.17¾	.18	.17¾	.18	....	.18
Red, dry, 95% $Pb^{3}O^{4}$						
bbls..................lb.	.17½	.18½	.17½	.18½	.14¼	.19¼
97% $Pb^{3}O^{4}$, bbls, delv...lb.	.17½	.18¾	.17½	.18¾	.15	.19½
98% $Pb^{4}O^{4}$, bbls, delv...lb.	.18	.19	.18	.19	.15¼	.19¾
White, bbls..............lb.	.16	.16¼	.16	.16¼	.13	.17¾
Basic sulfate, bbls, lcl...lb.	.15¼	.15½	.15¼	.15½	.12½	.15½
Lime, Chem., wks, bulk....ton	6.50	10.25	6.50	10.25	6.50	10.25
Hydrated, f.o.b. wks.....ton	8.00	12.14	8.00	12.14	8.00	12.14
Litharge, coml, delv, bbls...lb.	.1660	.17½	.1660	.17½	.13	.17½
Lithopone, ordi., bgs........lb.	.05½	.06	.05½	.06	.03	.06
Magnesium Carb, tech, wks..lb.	.07¼	.10¾	.07¼	.10¾	.07¼	.10¾
Chloride flake, bbls, wks c-l..................ton	....	40.00	....	40.00	....	37.00
Manganese Chloride, Anhyd. bbls..................lb.	.12¾	.16	.12¾	.16	.14	.16
Dioxide, Caucasian bgs, lcl..................ton	74.75	79.75	74.75	79.75	74.75	79.75
Methanol, pure, nat, drs..gal. *l*	.63	.73	.63	.73	.63	.73
Synth, drs cl..........gal. *m*	.34½	.41½	.34½	.41½	.31	.41½
Methyl Acetate, tech tks....lb.	.06	.07	.06	.07	.06	.07
C. P. 97-99%, tks, delv..lb.	.09½	.12	.09½	.12	.09½	.10½
Chloride Indust., cycl, wks.lb.	.16	.41	.16	.41	.32	.41
Ethyl Ketone, tks, frt all'd.lb.	....	.10	....	.10	....	.09
Naphtha, Solvent, tks......gal.	....	.28	....	.28	....	.28
Naphthalene, crude, 74°, wks, tks..................lb.	.04½	.05¾	.04½	.05¾	.035	.083
Nickel Salt, bbls. NY.......lb.	.14	.14½	.14	.14½	.14	.14½
Nitre Cake, blk............ton	20.00	24.00	20.00	24.00	....	24.00
Nitrobenzene, drs, wks......lb.	.08½	.10	.08½	.10	.08	.09½
Orthoanisidine, bbls.........lb.	....	.80	....	.80	....	.70
Orthochlorophenol, drs......lb.	....	.37	....	.37	.25	.37
Orthodichlorobenzene, drs...lb.	.07½	.10½	.07½	.10½	.07	.10½
Orthonitrochlorobenzene, wks..................lb.	.15	.18	.15	.18	.15	.18
Orthonitrotoluene, wks, drs..lb.	.08	.09	.08	.09	.08	.09
Paraldehyde, 98%, wks lcl...lb.	.12½	.13½	.12½	.13½	.22	.13½
Chlorophenol, drs.........lb.	.25	.29	.25	.29	.24	.29
Dichlorobenzene, wks.....lb.	.12½	.14	.12½	.14	.12½	.14
Formaldehyde, drs, wks...lb.	.21	.23	.21	.23	....	.22
Nitroaniline, wks, kgs.....lb.	.41	.43	.41	.43	.41	.43
Nitrochlorobenzene, wks...lb.	....	.15	....	.15	....	.18
Toluenesulfonamide, bbls..lb.	....	.70	....	.70	....	.70
Toluidine, bbls, wks......lb.	.44	.53	.44	.53	....	.53
Penicillin, ampules per 100,000 units, bulk.......	.14	.19	.14	.19	.14	.38
Pentaerythritol, tech.....lb.	.32	.36	.32	.36	.27	.36

PETROLEUM SOLVENTS AND DILUENTS

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Lacquer diluents, tks, East Coast...........gal.	.13	.16	.13	.16	....	.14
Naphtha East tks, wks............gal.	.11	.14	.11	.14	....	.11
Rubber solvents, East, tks, wks..................gal.	.12½	.13	.12½	.13	....	.12
Stoddard Solvents, East, tks, wks..............gal.	.11½	.14	.11½	.14	....	.12

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Phenol, U.S.P., drs.........lb.	.11¼	.13¼	.11¼	.13¼	.11¼	.13¼
Phthalic Anhydride, cl and lcl, wks..................lb.	.14½	.20	.14½	.20	.14½	.17½
Potash, Caustics, 88-92%, wks, sol...............lb.	.06¾	.07½	.06¾	.07½	.06¼	.07½
Flake, 88-92%..........lb.	.07½	.08¼	.07½	.08¼	.07	.08¼
liquid, 45% basis, tks...lb.	....	.03½	....	.03½	....	.03½
drs, wks..............lb.	.0337½	.0375	.0337½	.0375	.03¼	.04
Carbonate hydrated 83-85%, bbls..........lb.	.05¾	.06	.05¾	.06	.06	.05¾
Chlorate crys, kgs, wks...lb.	.08½	.09¾	.08½	.09¾	.08½	.13
Chloride, USP, cryst., bbls.lb.	.21	.22	.21	.22	.21	.22
Cyanide, drs, wks.........lb.	....	.55	....	.55	....	.55
Iodide, drs..............lb.	1.95	1.98	1.95	1.98	1.44	1.98
Muriate dom, 60-62-63% $K^{2}O$ bulk unit-ton........	.37½	.53½	.37½	.53½	.37½	.53½
Permanganate, USP, wks drs...................lb.	.22½	.24	.22½	.24	.20½	.23
Sulfate, 90%, basis, bgs..ton	36.25	39.25	36.25	39.25	36.25	39.25
Propane, group 3, tks......gal.	.03½	.06¾	.03½	.06¾	.03½	.06¾
Pyridine, reg., drs.........lb.	.60	.69	.60	.69	.55	.65
R Salt, 250 lb. bbls, wks....lb.	.61	.72	.61	.72	....	.72
Resorcinol, tech. drs, wks...lb.	....	.68	....	.68	.64	.74
Rochelle Salt, cryst.........lb.	.31½	.35	.31½	.35	.32½	.35
Salt Cake, dom, blk wks....ton	20.00	26.00	20.00	26.00	....	26.00
Saltpeter, grn, bbls.....100 lbs.	8.00	9.50	8.00	9.50	8.20	9.50

l Producers of natural methanol divided into two groups and prices vary for these two divisions; *m* Country is divided into 4 zones, prices varying by zone. Spot price is ½c higher.

Current Prices

Oils & Fats Shellac

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Shellac, blchd. bone dry, bbls.....lb.	.58½	.66	.58½	.66	.58½	.74½
Silver Nitrate, bots, 2,500-oz. lots.....oz.	.42¼	.48	.42¼	.48	.42¼	.59
Soda Ash, 58% dense, bgs, c-l, wks.....100 lbs.	....	1.38	....	1.38	....	1.38
58% light, bgs cl.....100 lbs.	....	1.30	....	1.30	....	1.30
Caustic, 76% flake drs, cl.....100 lbs.	....	3.25	....	3.25	2.90	3.25
76% solid, drs, cl..100 lbs.	....	2.85	...	2.85	2.50	2.85
Liquid, 47-49%, sellers, tks.....100 lbs.	....	2.10	....	2.10	...	2.10
Sodium Acetate, anhyd., drs.....lb.	.06½	.11	.06½	.11	.06½	.11
Benzoate, USP drs.....lb.	.46	.52	.46	.52	.46	.52
Bicarb, USP, gran., bgs, cl., works.....100 lbs.	....	2.25	....	2.25	2.25	2.59
Bichromate, bgs, wks l.c.l..lb.	.08¾	.09¾	.08¾	.09¾	.07⅞	.09¾
Bisulfate powd, bbls, wks.....100 lbs.	3.00	3.60	3.00	3.60	3.00	3.60
35° bbls, wks.....100 lbs.	1.40	1.65	1.40	1.65	1.40	1.65
Chlorate, kgs, wks cl.....lb.	....	.07¼	....	.07¼	....	.06¾
Cyanide, 96-98%, d.s.....lb.	.14½	.15	.14½	.15	.14½	.15
Fluoride, 95%, bbls, d.s...lb.	.09¾	.10	.09¾	.10	.07¼	.10
Hyposulfite, cryst, bgs, cl, wks.....100 lbs.	....	2.75	....	2.75	....	2.75
Metasilicate, gran, bbl, wks c-l.....100 lbs.	3.25	3.40	3.25	3.40	....	3.40
Nitrate, imp. bgs, c.l.....ton	....	48.00	....	48.00	....	42.50
Nitrite, 96-98% bbl, cl.....lb.	....	.06¾	....	.06¾	....	.06¾
Phosphate, dianhyd. bgs, wks.....100 lbs.	6.25	7.00	6.25	7.00	6.00	7.00
Tri-bgs, cryst, wks. 100 lbs.	3.40	3.90	3.40	3.90	2.70	3.90
Prussiate, yel. bbls, wks...lb.	.12	.12¼	.12	.12¼	....	.12¼
Silicate, 52°, drs, wks...100 lbs.	1.55	2.00	1.55	2.00	1.40	2.00
40°, drs, wks, c-l...100 lbs.	.95	1.15	.95	1.15	....	1.15
Silicofluoride, bbls, NY...lb.	.06¼	.08½	.06¼	.08½	.06¼	.08½
Sulfate tech, Anhyd, bgs.....100 lbs.	2.10	2.60	2.10	2.60	1.70	2.60
Sulfide, cryst c-l, bbls, wks.....100 lbs.	....	3.75	....	3.75	....	3.00
Solid, bbls, wks.....lb.	3.50	5.50	3.50	5.50	3.05	5.50
Starch, Corn, Pearl, bgs, 100 lbs.	6.37	7.17	6.37	7.17	4.99	7.17
Potato, bgs, cl.....lb.	.0875	.1180	.0875	.1180	.0875	.1075
Rice, bgs.....lb.	no stocks		no stocks		no stocks	
Sweet Potato, bgs.....lb.	no stocks		no stocks		no stocks	
Sulfur, crude, mines.....ton	16.00	18.00	16.00	18.00	16.00	18.00
Flour, USP, precp, bbls, kgs.....lb.	.18	.30	.18	.30	.18	.36
Roll, bbls.....100 lbs.	2.45	3.40	2.45	3.40	2.65	3.40
Sulfur Dioxide, liquid, cyl...lb.	....	.09	....	.09	.07	.095
tks, wks.....lb	.04½	.05	.04½	.05	....	.044
Talc, crude, c-l, NY.....ton	...	15.00	....	15.00	....	15.50
Ref'd, c-l, NY.....ton	14.50	24.50	14.50	24.50	14.50	24.50
Tin, crystals, bbls, wks.....lb.	.55	.67	.55	.67	....	.60
Metal.....lb.	...	.91	....	.91	....	.80
Toluol, drs, wks.....gal	.28	.30	.28	.30	.28	.29½
tks, frt all'd.....gal.	....	.23	....	.23	....	.23
Tributyl Phosphates, drs, lcl, frt all'd.....lb	.68	.72	.68	.72	....	.72
Trichloroethylene, drs, wks..lb.	.09¼	.10½	.09¼	.10½	.08	.10½
Tricresyl phosphate tks.....lb.	.32¼	.36	.32¼	.36	.32¼	.33
Triethylene glycol, drs.....lb.	.18½	.19½	.18½	.19½	.18½	.19½
Triphenyl Phos., bbls.....lb.	.26	.29	.26	.29	.26	.32
Wax, Bayberry, bgs.....lb.	no stocks		no stocks		no stocks	
Bees, bleached, U.S.P. cakes.lb.	.65	.73	.65	.73	.68	.73
Candelilla, bgs, crude.....lb.	.61	.65	.61	.65	.62	.80
Carnauba No. 1, yellow, bgs, ton.....lb.	1.30	1.55	1.30	1.55	1.30	2.00
Xylol, Indus., frt all'd, tks wks.....gal.	.23	.30	.23	.30	....	.23
Zinc Chloride tech, fused, wks.....lb.	.0625	.0555	.0625	.0655	.05	.0655
Oxide, Amer., bgs, wks.....lb.	.08½	.10	.08½	.10	.09	.10
Sulfate, crys, bgs.....100 lbs.	4.15	4.90	4.15	4.90	3.40	4.90

OILS AND FATS

	Current Low	Current High	1948 Low	1948 High	1947 Low	1947 High
Babassu, tks.....lb.	.14½	.28½	.14½	.28½	.14½	.27½
Castor, No. 3, drs, c.l.....lb.	.27¾	.34¼	.27¾	.34¼	.27¾	.34¾
China Wood, drs, spot NY...lb.	.25¾	.27	.25¾	.27	.24	.41
Coconut, edible, drs Atlantic ports.....lb.	.18	.27	.18	.27	.18	.37
Corn, crude, tks, wks.....lb.	....	.32	....	.32	...	.31
Linseed, Raw, drs, c.l.....lb.	.3160	.3430	.3160	.3430	.3160	.3960
Menhaden, crude tks.....	.19	.22	.19	.22	.19	.22
Light, pressed, drs l.c.l....lb.	.16	.26	.16	.26	.16	.29
Palm, Niger, dms.....lb.	no prices		no prices		no prices	
Peanut, crude, tks, f.o.b. wks.lb.	.17	.30	.17	.30	.20	.37
Perilla, crude, dms, NY.....lb.	no stocks		no stocks		no stocks	
Rapeseed, bulks.....lb.	no prices		no prices		no prices	
Red, dms.....lb.	.17¾	.33¾	.17¾	.33¾	.17¾	.33¾
Soy Bean, crude, tks, wks...lb.	.15½	.29¾	.15½	.29¾	.15¼	.33
Tallow, acidless. dms.....lb.	.19½	.35	.19½	.35	.19½	.35

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1—Lehman 12"x30" Steel 3 Roll Mill.
4—Allbright-Nell 4' x 9' Atmos. Drum Dryers
1—Procter & Schwartz 6 truck Atmos. Dryer
1—No. 12 Sweetland Filter, 71—36" Copper Leaves, 2" Centers.
1—Huber type 25 ton Para Block Press
3—Baker-Perkins heavy duty Jack. Mixers, 100, 50, 20 and 9 gals.
6—Rubber Mills, 30", 36", 40", 48", 60" & 84"
12—Sperry, Shriver Iron Filter Presses 30" to 42"
2—Sperry 18" sq. Lead Filter Presses
11—Sharples No.5A, Centrifuges, Stainless
1—Abbe Pebble Mill 24" x 36", 30 gals.
2—M. G. Homogenizers, Stainless Steel
1—Automatic "SAMCO" Jr. Vac. Bottle Filler
6—Filling, Labeling, Cartoning & Wrapping Machines
3—Stokes & Day Powder Fillers
2—Stokes DR4 Rotary Tablet Machine 1 3/16"; also RD1 and RD2 1" and 1⅛" dia.
1—Cotton #2 Roary Tablet Machine, ⅝" dia.
10—Tolhurst 40" Suspended type Centrifugals, bottom discharge, motor driven
1—Chrystie 80" x 55' Rotary Dryer
1—Stokes #200 Automatic Molding Press
4—Stokes vert. High Vac. Pumps
3—Duriron 3"x2" Centrif. Pumps
6—Powder Mixers, 50, 100, 200, 600 & 1000 lbs.
1—Hardinge 3' x 8" Conical Ball Mill
20—Portable Elec. Mixers, ¼ to 2 H.P.
4—Pfaudler Glass-lined Jack. Kettles, 350, 400 and 500 gals., some agitated
15—Stainless Steel Jack. Kettles, 40 to 500 gals.
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Labor Relations

(*Continued from page* 397)

involves not only the removal of inequities within the plant and in the area but also the elimination of puzzling or intricate methods of computing piecework pay or incentive wages, so that each worker can tell for himself how much his envelope should contain.

5. *A formalized grievance procedure.* This is a "must" which should exist in every company—and so is a constant effort to see that the procedure is used.

Add these together, with modern methods, stir in a batch of old-fashioned *good faith in all dealings*—including if possible those with the union which the workers have chosen to represent them. It will succeed, if you keep it fresh and alive and up-to-date, because it is bound to reflect management's own desire for good human relations with the employees.

INDEX of ADVERTISERS

INDEX of ADVERTISERS

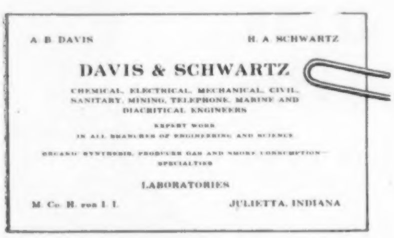
"WE"—EDITORIALLY SPEAKING

"WHAT DO WE DO in the infantry? We march, we march, we march." This old song ran through our mind as we read of a research project under way at the Army's Medical Department Field Research Laboratory at Fort Knox, Ky. A new type of shoe to relieve tired feet is one of the goals, but "the experimental shoes so far tested do not appear to prevent corns."

Atom bombs, jet-propelled aircraft, radar—but still the same old aching feet!

WE HAVE TO ADMIT to a damning confession: we're a fall guy for puns. A prominent silicate manufacturer recently told of a man who had two different kinds of wall board in his attic—one of which was manufactured with a silicate adhesive. The attic was eventually invaded by squirrels, who set to work gnawing the boards. One type they chewed to bits, but they were "choosy" and "eschewed" the silicate-bonded ones.

WE'RE NOT OLD ENOUGH to remember, but back in the second decade of the present century, apparently, a chemist had to know everything about everything. That's what we gather, at least, from the calling card A. B. Davis used in the days before he became one of the founding partners of Hilton-Davis Chemical Co.



One thing has us stumped, though: after consulting three dictionaries, we still don't know what a "diacritical engineer" does.

TRONA, CALIFORNIA, on the shores of Searles Lake, where American Potash & Chemical Co. operates its plant, has some of the flavor of the Old West—including an old desert hermit formerly called Seldom-Seen Slim.

Formerly, we say, for during the war American Potash, short of manpower like everyone else, tried to persuade Slim to take a steady job. The project was lamentably unsuccessful. Not only did Slim not take a job, but the whole idea so unnerved him that he has since been seen less frequently than before, and he is now known to the inhabitants as Seldomer-Seen Slim.

FIFTEEN YEARS AGO

(From Our Files of March, 1933)

Federal legislation is offered to require 10 per cent alcohol in motor fuels. Hoping to get rid of their unmarketable grain surpluses, farmers, particularly in Iowa and Indiana, are urging the placement of heavy taxes on motor fuel not containing alcohol distilled from farm products. Henry A. Wallace is reported in favor.

Foreign chemical trade for 1932 showed a marked decline in the total. There was increased exportation of synthetic sodium nitrate. Imports of coal tar dyes were responsible for six, exports for four per cent of the total chemical foreign trade. Figures in 1932 were $72,000,000 for imports and $95,000,000 for exports.

According to the Five-Year-Plan, Russian chemical industry was to have produced 345,000 tons of soda in 1932. Actual production was about 320,000, while demand from the home market was 900,000 tons. Despite this failure to meet home needs, 18,000 tons were exported during the first half of 1932.

S. De Witt Clough is elected president and general manager of Abbott Laboratories succeeding the late Alfred S. Burdick.

THIRTY YEARS AGO

(From Our Files of March, 1918)

U. S. Industrial Alcohol Co. for the calendar year of 1917 reports the largest earnings in its history with profits amounting to about $55.75 a share on common stock, as compared with $36 in 1916.

E. I. du Pont de Nemours & Co. announce increases in salaries amounting to 35 per cent on the first $100, 30 per cent on the second, and above that, 22 per cent.

Government takes over Dow Chemical's plants at Midland and Mount Pleasant, advancing $2,000,000 for enlargement and new equipment in order adequately to supply the chemicals needed for manufacture of munitions.

Monsanto Chemical Works purchases Commercial Acid Co., consolidating the two incorporations in one company with authorized capitalization of $5,000,000.

NOW IS THE TIME, according to several things we've read, for progressive companies to intensify research activities. In the spirit of public service we publish here an abstract of an article, in the current issue of Witco Chemical Co.'s *Witcomings*, entitled "How To Do Research":

From a brief but intensive study of the subject, research appears to consist largely in repairing leaks in apparati.

In order to do research, you must have ideas. One idea is sufficient. A second idea is apt to contradict the first.

Ideas are easy to get. If you haven't any of your own, there are several prolific sources. (1). Ask one of the salesmen. This is a dependable source of information concerning things that any half-witted research department would have developed years ago. (2). Ask the officers of the company. They know just what should have been done if certain responsible persons had been on the job.

However, it is a question whether even one idea is necessary. Merely get some equipment, set it up in a complicated manner, and carry out a few experiments.

Readings should be taken at the point where it is considered results will be the most favorable. These readings should be plotted against other numbers that may be selected at random. If you get a straight line, you know at once the results could have been predicted.

If you get a curve, the situation is different. Examine the curve carefully for sharp breaks or bends. If you find one, you have made a discovery. These breaks are significant. From them you should develop a theory.

Having obtained a curve and concocted a theory, it is befitting that you present the matter before a meeting of some important scientific society.

Always prepare a few slides which can be shown at embarrassing moments.

First write nine long equations on the blackboard. Memorize the equations beforehand if possible. Write them rapidly. The success of your talk will depend directly on the number of people you can shake off at this point.

Someone will call your attention to the fact that the fifth term of the second equation should have a minus sign, which you can obligingly change, since it doesn't mean anything anyway.

When you see a vacant stare, indication of a temporary lapse of intelligence, steal into the eyes of the audience, stop, pause for effect, gather up all papers and ask for questions.

Abstracts of U. S. and Foreign Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

Requests for further information or photostated copies of Canadian patents should be addressed to the Commissioner of Patents and Copyrights, Department Secretary of State, Ottawa, Canada.

U. S. Patents and Official Gazette—Vol. 604, Nos. 1, 2, 3, 4 (October 21 - November 11)
Canadian Patents Granted and Published December 23 - January 20

*Organic

New compositions of matter higher esters of chloronitro alcohols having structural formula described in patent. No. 2,427,821. John B. Tindall to Commercial Solvents Corporation.
Process for preparing 1-aryl-2-oxoalkanes having general formula described in patent. No. 2,427,822. John B. Tindall to Commercial Solvents Corporation.
Recovering isoprene and piperylene from hydrocarbon mixture containing isoprene and piperylene in admixture with other hydrocarbons of greater degree of saturation. No. 2,427,925. Jose A. Samaniego and Mott Souders, Jr., to Shell Development Company.
Removing organic sulphur compounds present in coal tar and coke oven light oils from aromatic hydrocarbons. No. 2,427,988. Philip J. Wilson, Jr., Joseph H. Wells and Pauline M. Sommerfeld to Carnegie-Illinois Steel Corporation.
Esters of valerolactone. No. 2,428,015. Ralph Daniels and Harold Levy to Burton T. Bush, Inc.
Separating pure beta-ethylnaphthalene from mixture of ethylnaphthalene isomers. No. 2,428,102. Wojciech Swietoslawski to Koppers Company, Inc.
Continuous process for manufacture of ethers from normally gaseous olefins. No. 2,428,119. Clifford G. Ludeman to Texaco Development Corporation.
Recovering furfural from mixture of furfural and polymer. No. 2,428,120. Gordon H. Miller to The Texas Company.
Production of aromatic hydroxy ether comprises reacting epoxide compound with phenol in presence of stannic chloride. No. 2,428,235. Kenneth E. Marple, Edward C. Shokal and Theodore W. Evans to Shell Development Company.
Alkamine derivatives of meta aminomethyl benzoic acid. No. 2,428,239. Robert P. Parker and Arthur J. Hill to American Cyanamid Company.
Water-soluble derivatives of 2-methyl-1,4-dihydroxy-naphthalene and processes for their production. No. 2,428,253. Fritz von Werder.
New composition, 4-isopropyl-cyclohexyl-ethanol. No. 2,428,352. Joseph P. Bain and Albert H. Best to The Glidden Company.
Lower aliphatic esters of ethylene and propylene-diamine N,N'-tetra-acetic acids. No. 2,428,353. Frederick C. Bersworth.
Amino-substituted acridines. No. 2,428,355. Joseph H. Burkchalter, Eldon M. Jones and Albert L. Rawlins, Frank H. Tendick and Walter F. Holcom to Parke, Davis & Company.
Chromium aldonate compositions. No. 2,428,356. Allan E. Chester and Frederick F. Reisinger to Poor & Company.
Amines in I-steroid series. No. 2,428,368. Percy L. Julian and John Wayne Cole and Edwin W. Meyer to The Glidden Company.
Tetraacetyl ribonyl chloride. No. 2,428,437. Max Tishler to Merck & Co., Inc.
Catalytic oxidation of sorbose derivatives. No. 2,428,438. Nelson R. Trenner to Merck & Co., Inc.
Preparing purified mixtures of esters adapted to be hydrolyzed to mixtures of alcohols. No. 2,428,450. Michael A. Eitelman to Allied Chemical & Dye Corporation.
Shifting carbon to carbon double bond in 1-olefin having at least four carbon atoms, comprises passing olefin over solid contact catalyst comprising titanium tetrafluoride. No. 2,428,455. Alvin H. Friedman to Phillips Petroleum Company.
Recovering toluene in petroleum fraction in purity of 90% or more. No. 2,428,467. Theodor A. Petry and Russell Lee and John L. Biles and William V. Betts to Socony-Vacuum Oil Company, Inc.
Production of allyl type compounds. No. 2,428,590. Edward C. Shokal and Theodore W. Evans to Shell Development Company.
Nitronitriles of formula $R_1R_2C(CN)—CHR_3NO_2$ wherein R_1 and R_2 are selected from hydrogen and lower alkyl radicals. No. 2,428,614. Gerard Dunstan Buckley and Royden Lewis Heath to Imperial Chemical Industries, Ltd.
Dehydrogenating butene-2, comprises forcing mixture of steam and butene-2, and CO_2 through bed of MgO, Fe_2O_3, and K_2CO_3 in reaction zone. No. 2,428,624. Clinton H. Holder to Standard Oil Development Company.
In sulfuric acid absorption of isobutylene, improvement comprises heating isobutylene-containing hydrocarbon gas heating sulfuric acid, commingling hydrocarbon gas and sulfuric acid in atomized state. No. 2,428,668. Henry J. Hibshman and Insley P. Jones to Standard Oil Development Co.
Dehydrating oil consisting of glyceryl esters of rinoleic acid. No. 2,428,673. Harry Miller to National Agrol Company, Inc.
Preparing carbon disulfide. No. 2,428,727. Carlisle M. Thacker to The Pure Oil Company.
Preparing hydrocarbon sulfonyl chlorides which upon saponification have excellent wetting action. No. 2,428,733. Friedrich Asinger to General Aniline & Film Corporation.
Improved process for alkylation of mono-hydric phenols with olefins comprising treating mono-hydric phenol in presence of catalytic amount of tetraphosphoric acid with olefin containing at least three carbon atoms at 30 to 70°C. No. 2,428,745. Gordon H. Stillson to Gulf Research & Development Company.
Preparing ethyl fluosulfonate by reacting ethyl fluoride and fluosulfonic acid. No. 2,428,755. Carl B. Linn to Universal Oil Products Company.
Anthrimide carbazole thioxanthones derived from 3.2-(S)-1'.2'-(S)-6'-halogen thioxanthones. No. 2,428,758. Fritz Max and David I. Randall to General Aniline & Film Corporation.
Anthraquinone thioxanthone carbazoles in which anthraquinone thioxanthone nucleus is linked to carbazole nucleus through amide linkage. No. 2,428,759. Fritz Max and David I. Randall to General Aniline & Film Corporation.
Separating 2-acetoxy-butanal from mixture selected from acetic oil and acetic oil which has been freed of acidic ingredients by neutralization. No. 2,428,760. Alfred A. Reiter and Floyd L. Beman to Cliffs Dow Chemical Company.
Dioxolanes and methods of preparing. No. 2,428,805. Morris S. Kharasch to Eli Lilly and Company.
Producing aldol by condensation of acetaldehyde. No. 2,428,846. David C. Hull, one half to Air Reduction Company, Inc.
New compound, 1,2,3,6-tetrahydrodurylic acid. No. 2,428,860. James A. Van Allan and Jean Elmore Jones to Eastman Kodak Company.
Isomerizing hydronaphthalene selected from tetrahydronaphthalene and decahydronaphthalene. No. 2,428,923. Charles L. Thomas and Herman S. Bloch to Universal Oil Products Company.
Alpha-halo, Beta-oxy suberic acid and esters thereof. No. 2,428,955. Bernard R. Baker and Sidney R. Safir and Seymour Bernstein to American Cyanamid Company.
Basic derivatives of alpha-substituted aryloxy acetic acids and process for manufacture. No. 2,428,978. Henry Martin and Franz Hafliger to J. R. Geigy A. G.
Preparing dihalonitrile by reaction between alpha, beta-unsaturated nitrile and halogen, step of initiating reaction in presence of anhydrous hydrogen halide. No. 2,429,031. Jack D. Robinson to Wingfoot Corporation.
Aromatic mercury phenolates of halogenated aromatics. No. 2,429,086. Carl N. Andersen to Gallowhur Chemical Corporation.
Primary aminoaryl mercaptans and Di-(primary aminoaryl) disulfides **as** fungicides. No. 2,429,095. Elbert C. Ladd to United States Rubber Company.
Pyridine-2-thiol and 2,2'-dithiodipyridine as fungicides. No. 2,429,096. Elbert C. Ladd to United States Rubber Company.
N,N'-dithiodimorpholine as fungicide. No. 2,429,097. Elbert C. Ladd to United States Rubber Company.
1-Phenyl-2-piperonylidene-hydrazine as fungicide. No. 2,429,098. Elbert C. Ladd to United States Rubber Company.
Benzoquinone mono-oxime semicarbazone as fungicide. No. 2,429,099. Elbert C. Ladd to United States Rubber Company.
Separation of acetylenes and butadiene from ammoniacal cuprous salt solution containing initially butadiene and acetylenes absorbed therein. No. 2,429,126. Richard A. Given to Standard Oil Development Company.
Manufacture of ethyl alcohol from sulphite residual liquor. No. 2,429,143. George H. Tomlinson to Howard Smith Paper Mills, Ltd.
Producing dihydroxyfluoboric acid comprises mixing together water, material of group consisting of boric acid and boric oxide, fluorine compound in absence of available water values in excess of amount converted to dihydroxyfluoboric acid. No. 2,429,147. Wayne E. White to Aluminum Company of America.
Separation and purification of stereoisomeric hydrophenanthrene carboxylic acids and cyclic homologues thereof. No. 2,429,166. Karl Miescher and Jules Heer to Ciba Pharmaceutical Products, Inc.
2-Methyl-6-cumyl-benzoxazole and quaternary ammonium salts thereof. No. 2,429,178. Alfred W. Anish.
2-beta-acetanilidovinyl-6-cumyl-benzoxazole and quaternary ammonium salts thereof. No. 2,429,179. Alfred W. Anish.
Sulfurized talloil cutting oil composition stable against formation of sludge. No. 2,429,198. Louis H. Sudholz and Cecil D. Flemming to Socony-Vacuum Oil Company, Inc.

Canadian

Method of preparing a dialkamine ester of 1, 2, 4-trimethyl-pyrrole-5-carboxylic acid-3-acrylic acid. No. 445,334. American Cyanamid Company (Theodore F. Scholz).
Method of preparing a dialkamine ester of a 1-alkyl-pyrrole-3, 4-dicarboxylic acid. No. 445,335. American Cyanamid Company (Jackson P. Sickels).
Preparing dialkamine ester of 1-aralkylpyrrole-3, 4-dicarboxylic acid. No. 445,336. American Cyanamid Company (Jackson P. Sickels).
Preparing a mixed alkyl alkamine ester of a 1-alkylpyrrole-3, 4-dicarboxylic acid which comprises reacting a 1-alkyl-3-carbalkaxypyrrole-4-carboxylic acid with thionyl chloride and esterifying. No. 445,337. American Cyanamid Company (Jackson P. Sickels and Donald E. Sargent).
Process for the conversion of saturated aliphatic aldehydes into unsaturated aliphatic aldehydes by heating a saturated aliphatic aldehyde with water to a temperature between 100° and 250°C. under pressure. No. 445,350. The Distillers Company, Ltd. (Herbert Muggleton Stanley, Tadworth, and Gregoire Minkoff).
Process for the preparation of methyl glyceraldehyde. No. 445,351. The Distiller Company, Ltd. (Hanns Peter Staudinger and Karl Heinrich Walter Tuerck).
Method of alkylating a metallo derivative of a mono-substituted malonic ester. No. 445,371. Mallinckrodt Chemical Works (David M. Jones).

**U. S. Patents from Vol. 603, Nos. 1, 2, 3, 4.*
Canadian from December 2 - December 16.

The Compound di-alpha-hydroxyisobutyric acid ester of monophenyl glyceryl ether. No. 445,436. American Cyanamid Company (Jack T. Thurston and John M. Grim).

As a new composition of matter, alpha, beta-dicyano diethyl ether. No. 445,455. Canadian Industries, Ltd. (Virgil Leland Hansley).

Water-soluble composition comprising a complex compound of the Werner type in which a trivalent nuclear chromium atom is co-ordinated with a naphthoato group. No. 445,456. Canadian Industries, Ltd. (Ralph Kingsley Iler).

Process for the production of hydrocyanic acid. No. 445,462. Canadian Industries, Ltd. (Terence Neil Mongomery and Lionel Willoughby Wynne Clarke).

Manufacture of vinyl chloride by passing acetylene and hydrogen chloride into suspension in paraffin oil of active carbon impregnated with mercuric chloride. No. 445,472. The Distillers Company, Ltd. (Herbert Muggleton Stanley).

Method of preparing a glycol bis (saturated alcohol carbonate) ester which comprises reacting a bis chloroformate of a glycol with a saturated monohydric alcohol. No. 445,502. Pittsburgh Plate Glass Company (Irving Elkin Muskat and Franklin Strain).

Process for separating 2, 3, 6-trimethylphenol from a mixture of phenols. No. 445,516. Shell Development Company (Daniel B. Luten, Jr., and Aldo DeBenedictis).

Process for the production of 3, 5-dimethyl phenol from isophorone. No. 445,517. Shell Development Company (De Loss E. Winkler and Seaver).

Demulsifying agent for water-in-oil emulsions comprising a sulphonic body derived from a non-paraffinic extract of a petroleum oil. No. 445,519. Standard Oil Development Company (Bradshaw F. Armendt).

Preparing vinyl chloride by reacting acetylene with hydrogen chloride in the vapour phase in the presence of catalyst comprising as an essential component, beta-chlorovinyl mercuric chloride. No. 445,613. The B. F. Goodrich Company (James A. Bralley).

*Packaging

Device for treating containers. No. 2,427,811. Hyman Richard Rich to Enoz Chemical Company.

Pressure relief closure for containers. No. 2,428,114. Gustave A. Hall.

Cloth and paper bag. No. 2,428,266. Henry Stuart Daniels to Union Bag & Paper Corporation.

Sheet metal hermetically sealed container. No. 2,428,371. Hjalmar Kinberg to American Can Company.

Air-tight sheet metal container capable of air-tight reclosure. No. 2,428,393. John E. Socke to American Can Company.

Sealed air-tight sheet metal container. No. 2,428,394. John E. Socke to American Can Company.

Knock down container. No. 2,428,396. Charles A. Southwick, Jr., to Shellmar Products Corporation.

Thermal container comprising inner member, outer member, and filling of heat insulation material. No. 2,428,588. Harry E. Schroeder and John B. Meek.

Carton closure for carton having rectangularly arranged body walls and closure wall hingedly secured to one of body walls. No. 2,428,845. Reynolds Guyer to Waldorf Paper Products Company.

*Paper, Pulp

Machine for coating paper. No. 2,428,113. William F. Grupe to John K. Ditmars.

Suppressing foam formed during formation of paper web on Fourdrinier wire when web is formed of stock containing rosin size and calcium resinate to cause foaming consists in spraying on web on Fourdrinier wire before formation of sheet is completed solution containing fatty acid anion. No. 2,429,030. Francis G. Rawling to West Virginia Pulp and Paper Company.

*Petrolium

Isomerization process comprises contacting isomerizable saturated hydrocarbon with isomerizing catalyst comprising Friedel-Crafts type metal halide and hydrogen halide in presence of from 0.1% to 10% by volume based on saturated hydrocarbon of mono-substituted aromatic hydrocarbon in which substituent group is chlor or nitro radical. No. 2,427,775. Bernard S. Friedman to Universal Oil Products Company.

Catalytic reforming process comprises subjecting mixture of straight-run gasoline fraction and thermally cracked gasoline fraction, to action of reforming catalyst in presence of hydrogen, etc. No. 2,427,800. William J. Mattox to Universal Oil Products Company.

Cracking heavy hydrocarbon oil. No. 2,427,820. Charles L. Thomas to Universal Oil Products Company.

Completing oil well in poorly-consolidated oil sands. No. 2,427,848. Allen D. Garrison to Texaco Development Corporation.

Converting naphthenic hydrocarbons to paraffinic hydrocarbons containing same number of carbon atoms in molecule. No. 2,427,865. Arthur P. Lien and Bernard L. Evering to Standard Oil Company.

Avoiding emulsification difficulties and promoting separation of raffinate phase from extract phase in selective solvent extraction of viscous hydrocarbon oil employing nitrobenzene as extraction solvent, comprises adding to extraction system small amount of ammonia and of alkaline earth metal soap of fatty acid. No. 2,428,067. George H. Evans, Ferdinand T. Klopsch and Darwin M. McCormick to The Atlantic Refining Company.

Dehydrogenation of aliphatic C_2 to C_5 paraffin hydrocarbons to less-saturated aliphatic hydrocarbons. No. 2,428,151. Frederick E. Frey to Phillips Petroleum Company.

Determining anisotropy of strata penetrated by well bores. No. 2,428,155. Hu ert Guyod.

Conversion of hydrocarbon oil comprises subjecting oil under conversion conditions to contact with catalyst composite comprising precipitated hydrated silica, precipitated hydrated alumina and precipitated hydrated zirconia free of alkali metal compounds and tripoli free of alkali and alkaline earth metal compounds and metal oxide impurities. No. 2,428,257. Jacob E. Ahlberg and Charles L. Thomas to Universal Oil Products Company.

Synthesis of hydrocarbons comprises reacting aromatic hydrocarbon with alkylating agent under alkylating conditions in presence of boron trifluoride and fluorosulfonic acid. No. 2,428,279. Vladimir N. Ipatieff and Carl B. Linn to Universal Oil Products Company.

Preparing high octane fuel from normal butane comprises catalytically isomerizing normal butane to form iso-butane, pyrolyzing portion to produce butylene, and catalytically alkylating with iso-butane produced. No. 2,428,417. Wright W. Gary to The M. W. Kellogg Company.

Alkylating isoparaffin by reaction with olefin in presence of concentrated sulfuric acid, improvement comprises bringing diverted emulsion into contact with isoparaffin being alkylated in extraction zone, etc. No. 2,428,506. Johannes H. A. P. Langen Van der Valk to Shell Development Company.

Separating isobutylene from admixture with butene-1 comprises passing liquid mixture of butene-1 and isobutylene over calcined brucite as isomeriztion catalyst in reaction zone, etc. No. 2,428,516. Harry E. Drennan to Phillips Petroleum Company.

Treating natural hydrocarbon gas for separation of ethane product and natural gasoline product. No. 2,428,521. John W. Latchum, Jr., to Phillips Petroleum Company.

In hydrocarbon conversion process for production of motor fuel of improved quality, steps comprising introducing stream of hydrocarbon oil into closed zone where same is cracked in admixture with superheated steam, etc. No. 2,428,532. Walter A. Schulze and Carl J. Helmers to Phillips Petroleum Company.

Converting hydrocarbons in presence of catalyst comprises heating hydrocarbon oil adding powdered catalyst heating suspension, etc. No. 2,428,666. Charles E. Hemminger to Standard Oil Development Company.

Treating hydrocarbon feed stock with solution comprising aryl sulfonic acid. No. 2,428,686. George H. Shipley, Jr., and Glenn W. Wilson, Jr., to Standard Oil Development Company.

Refining low-boiling hydrocarbon distillates. No. 2,428,690. Charles W. Tyson, Donald L. Campbell, Homer Z. Martin and Eger V. Murphree to Standard Oil Development Company.

Producing isobutane and isopentane, comprises destructively hydrogenating petroleum hydrocarbons boiling above 100°F and below 800°F in presence of hydrogen and of catalyst containing an element selected from nickel, cobalt, tungsten and molybdenum, etc. No. 2,428,692. Alexis Voorhies, Jr., to Standard Oil Development Company.

Separating mixture of open-chain and closed-ring hydrocarbons into plurality of fractions, etc. No. 2,428,695. Donald C. Bond and Michael Savoy to The Pure Oil Company.

Converting insufficiently cracked liquid hydrocarbons from cracking operation in which siliceous catalyst is used to crack fresh charging stock to gasoline-boiling hydrocarbons of high anti-knock properties. No. 2,428,715. Milton M. Marisic to The Pure Oil Company.

Conversion of hydrocarbons comprises contacting hydrocarbon vapors with catalytic composition prepared by depositing silica on active alumina treating composite produced with mixture of hydrogen fluoride and phosphoric acid. No. 2,428,741. Charles J. Plank to Socony-Vacuum Oil Comany, Inc.

Treating saturated hydrocarbon material containing as impurity a small percentage of organically combined fluorine to remove fluorine therefrom comprises contacting hydrocarbon material with fluosulfonic acid at defluorinating conditions of temperature and pressure. No. 2,428,753. Carl B. Linn to Universal Oil Products Company.

Treating hydrocarbon material containing impurity small percentage of organically combined fluorine to remove fluorine therefrom comprises contacting hydrocarbon material with chlorosulfonic acid at defluorinating conditions of temperature and pressure. No. 2,428,754. Carl B. Linn to Universal Oil Products Company.

Conversion of hydrocarbons comprises contacting hydrocarbons with catalyst produced by subjecting inorganic oxide hydrosol capable of setting to gel to unidirectional electrical field of orientation during its period of gelation, washing resultnig gell free of water soluble salts, drying. No. 2,428,798. Clarence I. Glassbrook and Rowland Hansford to Socony-Vacuum Oil Company, Inc.

Obtaining pure streams consisting of n-pentane, isopentane, pentene-1, and pentene-2 from C_5 hydrocarbon stream containing same. No. 2,428,815. Carl R. Sandberg and Gloria B. Patterson to Socony-Vacuum Oil Company, Inc.

Continuous process for production of branched chain alkanes from normal alkanes. No. 2,428,841. Eric William Musther Fawcett and Gwilym Islwyn Jenkins to Anglo-Iranian Oil Company, Ltd.

Catalytic contacting system comprises upflow reactor concentric within regenerator, reactor standpipe extending from within reactor to point near base of regenerator, means for introducing hydrocarbon into lower part of reactor, etc. No. 2,428,872. Robert C. Gunness to Standard Oil Company.

Isomerization of butane wherein reaction occurs in reaction zone in presence of volatilizable aluminum halide catalyst activated with corresponding hydrogen halide and vaporous effluent containing at least one normally gaseous paraffin hydrocarbon and hydrogen halide it withdrawn from reaction zone. No. 2,428,883. Henry H. Lee to Phillips Petroleum Company.

Conversion of low-boiling hydrocarbon with volatilizable Friedel-Crafts type metal halide catalyst. No. 2,428,981. Charles O. Meyers to Phillips Petroleum Company.

Hydrogenation of hydrocarbons. No. 2,429,115. George T. Atkins, Jr., to Standard Oil Development Company.

Catalytic process for treating hydrocarbons with metallic halide. No. 2,429,125. Otto Gerbes to Standard Oil Development Company.

Hydrocarbon conversion process using powdered catalyst in cracking step and in hydrocarbon product retreating step where catalyst regeneration zones are used for burning off carbonaceous material from fouled catalyst resulting from both steps. No. 2,429,127. John M. Graham and Edwin J. Gohr and Charles W. Tyson to Standard Oil Development Company.

Aviation motor fuel for aviation motor under rich mixture conditions comprises isoparaffinic hydrocarbons having 6 or more carbon atoms in molecule, tetraethyl lead, ethyl benzoate, and xylidine. No. 2,429,133. Thomas B. McCulloch to Standard Oil Development Company.

Improvements in separation and concentration of olefins from hydrocarbon mixtures containing olefins and relatively more saturated hydrocarbons of similar boiling range. No. 2,429,134. Charles E. Morrell and Miller W. Swaney to Jasco, Inc.

*Photographic

Bleach bath for removing only silver from photographic layer containing silver, and coupled dye images, comprising sulfuric acid solution of alkali metal dichromate and wetting agent selected from alkyl naphthalene sulfonates, alkyl aryl sulfonates and higher primary alkyl sulfates. No. 2,428,208. Richard O. Edgerton to Eastman Kodak Company.

*Polymers

Polymerizing monomeric material polymerizable to form rubber-like material, selected from open-chain aliphatic conjugated dienes alone and mixtures of open-chain aliphatic conjugated diene with unsaturated copolymerizable compound selected from aryl olefins and alkyl esters of acrylic and methacrylic acids in aqueous emulsion in presence of water-soluble alkali metal pyrophosphate. No. 2,427,847. Charles F. Fryling to The B. F. Goodrich Company.

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*U. S. Patents from Vol. 603, Nos. 1, 2, 3, 4.
Canadian from December 2 - December 16.*

Polymerizing isobutylene to liquid hydrocarbons comprises contacting isobutylene at 350°F to 600°F with bauxite which has been activated by heating at 700°F to 1800°F to residual moisture content of not more than 6% by weight. No. 2,427,907. Heinz Heinemann and William A. La Lande, Jr., to Porocel Corporation.
Copolymerization of butenes and propene. No. 2,427,954. Frederick E. Frey to Phillips Petroleum Company.
Making elastic vinyl copolymer resin textile articles. No. 2,428,453. Theophilus A. Feild, Jr., to Carbide & Carbon Chemicals Corporation.
Self-sealing gasoline container comprising self-sealing means and inner liner comprising polyvinyl acetal resin made with formaldehyde plasticized with diacetin. No. 2,428,527. David S. Plumb to Monsanto Chemical Company.
Method for casting thermoplastic resin. No. 2,428,697. Leon E. Champer to Frank H. Rolapp.
Producing clear water soluble stable resin by heating reacting urea and 37% aqueous formaldehyde in molar ratio of 1 part urea to 2-2.5 parts of formaldehyde. No. 2,428,752. Philip Stanley Hewett to Reichhold Chemicals, Inc.
Product of polymerization of mixture of compatible copolymerizable materials consisting of polymerizable unsaturated alkyd resin and polyallyl ester of saturated aliphatic polycarboxylic acid. No. 2,428,787. Gaetano F. D'Alelio to General Electric Company.
Resinous composition produced by polymerization of mixture of copolymerizable materials consisting of itaconic diester of unsaturated monohydric alcohol and polymerizable esterification product of polyhydric alcohol, alpha unsaturated alpha beta polycarboxylic acid and polycarboxylic acid selected from saturated aliphatic polycarboxylic acids and aromatic polycarboxylic acids. No. 2,428,788. Gaetano F. D'Alelio to General Electric Company.
Copolymers of diene and alpha-substituted beta-haloacrylonitrile. No. 2,428,907. Albert M. Clifford and Joy G. Lichty to Wingfoot Corporation.
Preparing polymerized materials comprises converting part of material selected from acrylonitrile, alpha alkyl acrylonitriles and alpha halo acrylonitriles to acrylate by heating in presence of sulfuric acid, water and monohydric saturated primary aliphatic alcohol, continuing heating until acrylate and unconverted material have copolymerized. No. 2,429,018. James D. D'Ianni to Wingfoot Corp.
Controlling polymerization of dihydric alcohol esters of alpha-olefinic dicarboxylic acids with ethylenic monomers. No. 2,429,060. Walter R. Hoover and Robert M. Paulsen and Stephen V. Landgraf to United States Rubber Company.

New resinous products for use as mold lubricants consisting of monobasic aliphatic carboxylic acid esters of lignin material formed by reduction of pH of black liquor of soda cook of woody matter to range between 7.8 and 9, aliphatic ester radicals having at least 12 carbon atoms. No. 2,429,102. Harry F. Lewis and Fridrich E. Brauns to The Mead Corporation.
Composition of matter comprising polymeric vinylidene chloride product and stabilizing agents therefor, from 0.3 to 2% of 2,2'-dihydroxy benzophenone and from 1 to 5% of xenyl salicylate. No. 2,429,155. Raymond F. Boyer to The Dow Chemical Company.
Composition of matter comprising polymeric vinylidene chloride product and, as stabilizing agent alkyl ester of acyl citric acid. No. 2,429,165. Lorne A. Matheson and Raymond F. Boyer to The Dow Chemical Company.

Canadian

A hard product of polymerization of a mixture comprising an isolated fusible partial polymer of divinyl benzene and styrene. No. 445,449. Canadian General Electric Company, Ltd. (Gaeta F. D'Alelio).
Stabilizing polymerizable vinyl aromatic compounds which includes admixing therewith a 2, 5 substituted hydroquinone. No. 445,490. The Mathieson Alkali Works (Edwin R. Erickson).
Process of preparing a stable aqueous emulsion of polyvinyl acetate. No. 445,642. Shawinigan Chemicals, Ltd. (Henry Michael Collins and Mogens Kiar).

**Processes and Methods*

High vacuum distillation process comprising circulating non-condensable gases through closed circuit under high vacuum, etc. No. 2,427,718. Orban Denys to Distillation Products, Inc.
System of regulating density of air-fuel mixture supplied by air swept pulverizing mills. No. 2,427,903. Joe Crites to Combustion Engineering Company, Inc.
Device for transforming changes of refractive index of liquid due to changes in composition of liquid into electrical currents. No. 2,427,996. William Seaman to American Cyanamid Company.
Treating oil with absorbent, comprises delivering oil in stream with adsorbent carried in suspension in downward direction into zone under substantial vacuum, splattering stream to finely divided oil and suspended adsorbent in form of spray, passing stream through spray in upward direction. No. 2,428,082. Robert R. King, Samuel E. Pack and Floyd W. Wharton to Mrs. Tucker's Foods, Inc.
Removing bacteria from aqueous media comprises activating granular dielectric material by appplying direct electric current potential of 100-2000 volts thereto, in presence of aqueous liquid by means of electrodes so that current passing between electrodes when liquid is present is in sufficient to kill bacteria in last-mentioned liquid, passing aqueous medium containing bacteria through bed of resulting activated dielectric material. No. 2,428,328. Garnet Philip Ham and Robert Bowling Barnes to American Cyanamid Company.
Removing bacteria from liquid media comprises activating granular dielectric material which is unexhausted anion active material by applying direct electric current potential of 100-2000 volts thereto, etc. No. 2,428,329. Garnet Philip Ham and Robert Bowlin Barnes to American Cyanamid Company.
Recovery of azeotrope former in azeotropic distillation of hydrocarbons. No. 2,428,611. Clyde H. O. Berg to Union Oil Company of California.
Process for stripping spent catalyst. No. 2,428,691. Charles W. Tyson to Standard Oil Development Company.
Minimizing production of foam in and priming of steam generators operating at superatmospheric pressures comprises incorporating with water diacyl derivative of aromatic polyamine. No. 2,428,775. Paul G Bird and Arthur L. Jacoby to National Aluminate Corporation.

**U. S. Patents from Vol. 603, Nos. 1, 2, 3, 4.*
Canadian from December 2 - December 16.

Heavy media separation process comprises maintaining pool of relatively large volume and pool of relatively small volume in end to end relation with restricted flow path from bottom of small volume pool into lower portion of other pool, etc. No. 2,428,777. Edmund C. Bitzer to Colorado Iron Works Company.
Minimizing production of foam in, and priming of steam generators operating under, superatmospheric pressure conditions comprises incorporating with water high-molecular-weight monoacyl derivative of piperazine. No. 2,428,801. Arthur L. Jacoby to National Aluminate Corporation.
Contacting solids of small particle size with at least two separate gaseous streams. No. 2,428,873. Robert C. Gunness and John F. Snuggs to Standard Oil Company.
Continuously maintaining predetermined conditions of temperature, humidity and solvent vapor content in atmosphere of enclosure wherein solvent is used. No. 2,428,885. Enrique L. Luaces to Chemical Developments Corporation.
In process wherein fluid reactant and subdivided solid catalyst are passed through reaction zone and fluid exothermically reacted, method of preventing excessive temperature rise in reaction zone. No. 2,428,914. Louis S. Kassel to Universal Oil Products Company.
Control of catalytic processes using mobile catalysts. No. 2,429,161. Thomas B. Hudson to Phillips Petroleum Company.

*Rubber

Plastometer for measurement of recovery properties of unvulcanized rubber and other materials of rubber nature. No. 2,427,796. Hector Atherton Macdonald to W. T. Henley's Telegraph Works Company Limited.
Making prous rubber polychrome printing plates. No. 2,427,836. Robert G. Chollar and Galen J. Wilson to The National Cash Register Company.
Making vulcanizates of vulcanizable butadiene-styrene copolymer. No. 2,427,942. Theodore A. Bulifant to Allied Chemical & Dye Corporation.
Compounding rubbery copolymer of butadiene and styrene with amorphous silica and product there of. No. 2,428,252. Gerald von Stroh to The Permanente Metals Corporation.
Manufacture of dipped rubber goods. No. 2,428,406. John M. Auzin to Ravol Rubber Company.
Apparatus for vulcanizing or curing hollow articles of rubber under internal and external fluid pressures. No. 2,428,944. Harry P. Schrank to Seiberling Rubber Company.
Reducing rate of cure of rubber-like copolymer of butadiene-1,3 and styrene with oxidizing agent and tetrachlor p-benzoquinone. No. 2,429,080. Robert R. Sterrett to United States Rubber Company.
Making shaped rubber articles. No. 2,429,121. Cornelius J. Crowley to The Seamless Rubber Company.
Method of making rubber gloves. No. 2,429,122. Cornelius J. Crowley to The Seamless Rubber Company.
Making shaped hollow rubber article. No. 2,429,123. Cornelius J. Crowley to The Seamless Rubber Company.

*Specialties

Halogenated quinoline insecticides. No. 2,427,677. William A. Knapp to General Chemical Company.
Cosmetic comprising aqueous solution of addition product of sulphurized oleic acid and triethanolamine having formula described in patent. No. 2,427,717. Frederick E. Dearborn.
Hydrocarbon lubricating oil, oxidation stability increased by addition of oil-soluble halogen-free organic sulfide and oil-soluble condensed ring polynuclear aromatic hydrocarbon. No. 2,427,766. Hyman Diamond to Shell Development Company.
Very viscous ink having extremely long body, capable of use in ball pointed fountain pen consisting of normally liquid higher alkenoic acid and wax-free mineral oil as vehicle, and organic dyestuff in solution in acid, proportion of acid to mineral oil being in three to one, proportion of acid to organic dyestuff being one to one. No. 2,427,921. Melvin A. Pfaelzer to Milton Reynolds.
Apparatus for discharging insecticide from airplanes. No. 2,427,987. Arch C. Wilson.
Insecticidal composition of matter comprising combination of active ingredient alpha: alpha-di-(p-chlorophenyl)-beta:beta:beta-trichlorethane formula described in patent. No. 22,922. Paul Muller to J. R. Geigy A. G.
Treating carbon brushes to increase their life and improve commutation level comprising subjecting them to solution containing suitable soluble compound of silver, then to action of suitable compound of sulphur, whereby silver sulfide is precipitated within pores of brushes. No. 2,428,036. Melville F. Peters and Anne A. Beal.
Lubricating grease comprised mainly of lubricating oil containing at least 20% by weight of refined Mid Continent base stock, and from 10 to 30% of sodium stearate. No. 2,428,123. John D. Morgan and Russell E. Lowe to Cities Service Oil Company.
Linoleum composition embodying filler and cement, cement constituting from 20% to 38% by weight of composition and containing oxidized and gelled siccative oil together with from 40% to 70% of chlorinated resin, etc. No. 2,428,282. James W. Kemmler to Sloane-Blabon.
Friction element for use upon vehicular brakes, clutches, comprised of mass of friction material inert filler, and friction-modifying agent, bonded with heat-reaction product of mixture of sulphurizable bonding material, etc. No. 2,428,298. Ray E. Spokes and Emil C. Keller to American Brake Shoe Company.
Friction element for use upon vehicular brakes clutches, comprises of mass of friction material, inert filler, and friction-modifying agent, bonded with heat-reaction product of mixture of suphurizable heat-polymerized linseed oil, together with heat-resistant phenol-aldehyde resin, and sulphur, etc. No. 2,428,299. Ray E. Spokes and Emil C. Keller to American Brake Shoe Company.
Reinforced plywood member comprising plurality of plies of wood and at least one layer of fibrous material all bonded together in super posed relation by an adhesive substance, fibrous material being in form of parallelly arranged strands each composed of multiplicity of glass fibers, etc. No. 2,428,325. Howard W. Collins to Owens-Corning Fiberglas Corporation.
Preparing lubricating composition comprising heating mixture of lithium soap and oxidized petroleum hydrocarbon to form solution, adding so-formed solution to mineral oil of lubricating viscosity. No. 2,428,340. Paul M. Ruedrich to Griffin Chemical Company.
Manufacture of sticking film, adding phenols, formaldehyde, hexamethylene tetramine, ammonia, and tannin. No. 2,428,358. Erich Cohnhoff.
Insecticidal comprising pyrethrum and dibenzyl phthalate. No. 2,428,494. Howard A. Jones and Raymond C. Bushland.
Pile surfaced acoustical blanket comprising mat of fine glass fibers haphazardly arranged and bonded together, coating of resinous film forming material on one face and needle punched perforations therein, etc. No. 2,428,591. Games Slayter to Owens-Corning Fiberglas Corporation.

Insecticidal composition comprising inert carrier and high-boiling fraction of reaction product obtained by heating naphthalene and diethyl benzene with Friedel-Crafts catalyst. No. 2,428,738. Robert R. Dreisbach and Fred W. Fletcher to The Dow Chemical Company.
Fly spray comprising member selected from N,N-diisopropylacetamide, N,N-diisobutylacetamide, and N-heptylacetamide as its essential knockdown agent and 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane as its essential active insecticidal ingredient, mineral oil carrier. No. 2,428,844. Samuel I. Gertler and Herbert L. J. Haller.
Producing pigmented gel composition comprising mixing organic hydrophilic colloid with alcohol; adding coloring matter insoluble in oil, water or colloid thereto whereby colloid is coated with coloring matter, etc. No. 2,428,896. Harry A. Toulmin, Jr. to Chemical Developments Corporation.
Manufacturing semi-conducting material for crystal contacts, comprising melting silicon together with small amount of additive, cooling melt slowly to produce solid product. No. 2,428,992. Charles Eric Ransley, John Walter Ryde, and Stanley Vaughan Williams to The General Electric Company, Ltd.
Rosin soldering flux having incorporated with it 0.2% to 8% of cetyl pyridinium bromide. No. 2,429,033. Harold Silman and Walter Stein to Joseph Lucas Limited.
In making dyed felt hat, steps of conditioning fur fibers for felting; dyeing with fast colors, combed cotton fibers to color of fur, subjecting cotton fibers to single chemical treatment with solution of 2%-10% melamine, 4%-9% hydrochloric acid (32%), 4%-10% formaldehyde, .5%-2% of sofener and the balance water, etc. No. 2,429,073. George M. Rickus, Stanley G. Hoffman and Bernard H. Archer to Hat Corporation of America.
Producing electrical condenser plates consists in applying to mica by means of meshed printing screen paste made from finely divided metallic silver, lead borosilicate flux and solution of cellulose nitrate in butyl lactate, firing at 500°C for 40 minutes. No. 2,429,089. Ernest Robert Box to Johnson, Matthey & Company, Ltd.
Insecticidal composition comprising pyrethrum and para-amino dimethyl aniline. No. 2,429,092. Stephen C. Dorman to Shell Development Company.

Canadian

Cleaning and polishing pad made of closely woven fabric and a filling abrasive of finely comminuted clam or oyster shells. No. 445,563 (Fredrich Hyer).

*Textiles

Method and apparatus for converting continuous filaments into spinnable slivers. No. 2,427,955. William H. Furness to American Viscose Corporation.
Producing viscose rayon comprises extruding viscose solution into acidic coagulating bath; withdrawing resulting viscose filaments from bath before completely regenerated, etc. No. 2,427,993. Kenneth M. McLellan to Industrial Rayon Corporation.
Producing fire resistant textile fabric comprising impregnating fabric with sodium carbonate solution, drying fabric, impregnating dried fabric with solution of antimony trichloride in organic solvent, drying fabric, passing fabric through warm solution of sodium carbonate, washing fabric with water, psaing fabric through solution of chlorinated paraffin. No. 2,427,997. Clarence B. White.
Product of manufacture comprising fabricated textile body of glass fibers, individual fibers of body having coating thereon which includes reaction product of formaldehyde with gelatin and direct formaldehyde setting dye. No. 2,428,302. William Leon Trowbridge to Owens-Corning Fiberglas Corporation.
Evaporating aqueous liquid from rayon yarn package at atmospheric pressure. No. 2,428,615. Alfred S. Brown to Skenandoa Rayon Corporation.
Preparing coated fabrics comprises applying to textile base fabric composition containing aqueous emulsion of polyvinyl chloride and from 30 to 100% thereof of plasticising agent removing water, applying composition containing polyvinyl chloride and plasticising agent, heating coated fabric. No. 2,428,716. John Heron McGill and Leslie Budworth Morgan to Imperial Chemical Industries, Ltd.
Treating fabrics and textile materials consisting at least in part of wool, to reduce natural tendency to shrink when washed in aqueous liquors comprising treating materials with dilute aqueous solution of alkali metal permanganate at pH of not less than 5 and with dilute aqueous soluion containing a substance selected from alkali hypohalite at pH of at least 7.5 and nitrogen-chloro compound. No. 2,429,082. Francis Malcolm Stevenson and John Leonard Raynes to Stevensons (Dyers) Ltd.

*Water, Sewage and Sanitation

Removing impurities from water comprising increasing ionic magnesium content of water, and adding lime. No. 2,428,418. Paul C. Goetz and Howard L. Tiger to The Permutit Company.

Agricultural

Insecticidal composition comprising pyrethrum and di-beta-methoxyethyl phthalate. No. 2,429,818. Howard A. Jones and Raymond C. Bushland.
Destroying insects by applying to insects insecticidal composition of matter, an active toxic ingredient of which is diaryl-dichloroethylene compound. No. 2,429,839. Paul Muller to J. R. Geigy, A. G.
Hydrophobic insecticidal powder consisting in dry free-flowing powder composed of homogeneous mixture of 4,4'-dichlorodiphenyl-1,1-trichloroethane with monalkyl amine adsorbed on inert powder at least 50% of which is tricalcium phosphate. No. 2,430,288. Albert L. Flenner to E. I. du Pont de Nemours & Company.
Exposing plant to lethal concentration of dimethyl cyanamidodithiocarbonate. No. 2,430,332. Hubert G. Guy and Harry F. Dietz to E. I. du Pont de Nemours & Company.
Dust concentrate to be dispersed in water to form agricultural fungicide spray compositions consisting of from 0.5 to 3.0% by weight of oil deposited on finely-divided chloranil, intimately mixed therewith minimum amount of wetting agent. No. 2,430,342. John Franklin Kagy and Kenneth D. Sloop to The Dow Chemical Company.
Pest control composition in form of powder which normally is hydrophilic containing toxicant and amount of stearylamine to impart hydrophobic properties but less than 7.5% by weight of composition. No. 2,430,576. Clarence A. Littler to E. I. du Pont de Nemours & Company

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Dihalopenhyl alkyl carbinol pesticides. No. 2,430,586. Robert F. Ruthruff, Oliver J. Grummitt and Berton C. Dickinson to The Sherwin-Williams Company.
Insecticidal composition comprising N-nitroso-N-aralkyl-arylamine as essential active ingredient and carrier therefor selected from clay and talc water containing dispersing agent. No. 2,430,721. Elbert C. Ladd to United States Rubber Company.
Derivatives of chlorinated quinones as fungicides. No. 2,430,722. Elbert C. Ladd and Merlin P. Harvey to United States Rubber Company.

Canadian

Free flowing, non-pelleting, dustible insecticide powder composed of sodium aluminum fluoride. No. 446,090. Aluminum Company of America (Daniel Chalmers McLean, John Emmet Morrow and Jacob Ronald Fox).

Biochemical

Producing methane from liquids containing fermentable organic material while at same time reducing biological oxygen demand of liquids in which process comprises anaerobic bacterial digestion of liquids in preliminary intermediate forming zone and later methane-forming zone. No. 2,429,589. Averill J. Wiley.
Manufacture of ethyl alcohol and glycerol by fermentation by yeast of solution containing sugar and buffering substances. No. 2,430,170. Cyril Ernest Grover to The Distillers Company, Ltd.
Production of useful products by microorganisms acting upon prepared sulfite waste liquor. No. 2,430,355. Joseph L. McCarthy.

Cellulose

Composition comprising cellulose ether and small amount based on cellulose of substituted terpene compound having formula described in patent. No. 2,429,603. Joseph N. Borglin and Alfred L. Rummelsburg to Hercules Powder Co.
Acetylating cellulosic material. No. 2,429,643. William Beach Pratt.
In carbohydrate esterification steps which include forming bromine pentoxide in situ in carbohydrate, acetylating carbohydrate with bromine pentoxide therein, stabilizing bromine pentoxide by oxygen during progress of acetylation. No. 2,429,644. William Beach Pratt.
Esterifying carbohydrate comprising impregnating carbohydrate with oxy-acid of halogen of greater atomic weight than fluorine in association with oxyacid selected from oxyacids of sulphur and phosphorus, etc. No. 2,429,645. William Beach Pratt.
Film-forming composition of matter comprising as its essential film-forming ingredient member of group consisting of cellulose acetate and ethyl cellulose, as plasticizer morpholide of organic acid selected from caprylic, capric, lauric, myristic and palmitic. No. 2,429,679. Louis W. Georges.
Preparing mildew-resistant cellulosic materials comprises impregnating cellulosic material with pentahalophenyl ester of carboxylic acid in which halogen is selected from chlorine and bromine. No. 2,430,017. Alva L. Houk to Rohm & Haas Company

Canadian

Composition comprising nitrocellulose dissolved in a mixture of methyl isobutyl ketone and diisobutyl ketone. No. 445,783. Shell Development Co. (Reginald Francis Buller).
Process for the production of cellulose esters of increased stability. No. 445,798 (Camile Dreyfus and George Schneider).

Ceramics

Tubular glassware forming apparatus. No. 2,429,220. Edward Danner.
Producing electrically conducting coating on vitreous substances. No. 2,429,420. Harold A. McMaster to Libbey-Owens-Ford Glass Company.
Non-lead glass composition comprising 56-64% of silica plus boric oxide, 22-30% of oxides of barium, strontium, magnesium, zinc, and calcium, 10-17% of alkali oxides, 0-5% of fluorine. No. 2,429,432. John Edwin Stanworth to General Electric Company.
Ceramic material from which is formed electric insulating member, material comprising 43% barium titanate and 55% titanium dioxide and flux. No. 2,429,588. Hans Thurnauer and James Deaderick to American Lava Corporation.
Fluophosphate optical glass containing titanium. No. 2,430,539. Kuan-Han Sun to Eastman Kodak Company.
Optical glass resulting from batch over 90% by weight or 95 cationic %, of which consists of oxides of cadmium, lanthanum, and boron. No. 2,430,540. Kuan-Han Sun and Thomas E. Callear to Eastman Kodak Company.

Coatings

Producing gasoline-resistant coating. No. 2,429,698. Wallace K. Schneider to Stoner-Mudge, Inc.
Iron or steel having inner binder coat and outer mastic coat on binder coat. No. 2,429,946. Edward Roach to William M. Farrer, Oscar A. Mellin and Grace M. Correo.
Preparing fire-resisting paint, comprising mixing ¼ gallon of glycerine and ¼ gallon nitro cellulose base lacquer with finely divided asbestos to form paste; mixing paste with 12 gallons of a water solution of sodium silicate, intermixing with vehicle 108 pounds of inert mineral pigments mixed with 2 gallons of drying oil. No. 2,429,957. Orazio La Cagnina to Bartolo Castellana, Elizabeth La Cagnina, Ignazio Villano, Paul Castellana and Salvatore Dalessandro.
Heat resistant coating composition consisting of 45% by weight of fly ash, 8% pentaerythritol abietate, 8% dehydrated castor oil, 2% lead acetate, 6% of 16% lead naphthenate in mineral spirits, 3% of 4% cobalt in mineral spirits, 10% mineral spirits, 18% V.M. & P. naphtha. No. 2,430,404. William A. MacFarland and Charles H. Cutter.
Forming adherent metal deposits on glass. No. 2,430,520. Evelyn C. Marboe to Glass Science, Incorporated.
Metallizing non-metallic body. No. 2,430,581. Leopold Pessel to Radio Corporation of America.
Heat sealing moistureproofing coatings. No. 2,430,726. James A. Mitchell to E. I. du Pont de Nemours & Company.
Electroplating to produce fissure network chromium plating. No. 2,430,750. Theodore H. Webersinn and Jacob Hyner to United Chromium, Inc.
Protective coating composition for coating metal surfaces, comprising base stock consisting of wax, from 3% to 15% by weight of lithium soap, a metal soap selected from soaps of lead, barium, and aluminum, and 0.5 to 2% by weight of antirust agent. No. 2,430,846. John D. Morgan to Cities Service Oil Company.

Canadian

Process of dyeing nitrogenous textile fibers. No. 445,737. Courtaulds Ltd. (James Hutchison MacGregor).
Pyrylium dye salt as filter and anti-halation dye in photographic materials. No. 446,001. General Aniline & Film Corp. (Thomas R. Thompson).

Equipment

Laboratory heater for rapid evaporation, drying, charring and ashing of substnces. No. 2,429,241. Jacob Ascher Schuldiner.
Cupola furnace for melting metals in divided form. No. 2,429,285. Frederick Arthur Woolley to The Midland Motor Cylinder Company Limited.
Apparatus for removing solid substances from liquid. No. 2,429,315. Walter H. Green to Infilco Incorporated.
Improving Clarification of turbid liquids by use of partially thickened sludge. No. 2,429,316. Walter H. Green to Infilco Incorporated.
Combined gravity classification and screening of ore. No. 2,429,436. Godfrey Buchanan Walker to American Cyanamid Company.
Device for determining vapor content of gas. No. 2,429,474. Howard O. McMahon to Arthur D. Little, Inc.
Circuit closer for temperature signal. No. 2,429,572. Andy H. Viscean.
Rod mill with material recirculation means. No. 2,429,627. Kalman Z. Huszar.
Reclaiming spent granular material including subjecting batch of spent material to consecutively arrnged rabbling and preheating treatment, etc. No. 2,429,667. Alfred C. Christensen to Herbert S. Simpson.
Reservoir for liquid hydrocarbons. No. 2,429,688. Walter R. Hoover to United States Rubber Company.
Separation of gases from solid particles. No. 2,429,751. Edwin J. Gohr and Roger W. Richardson to Standard Oil Development Company.
Means for indicating or regulating temperature of furnaces. No. 2,429,827. Uno Lamm to Allmanna Svenska Elektriska Aktiebolaget.
Well pumping equipment. No. 2,429,848. Archie G. Smith.
Refractory mortar maturing at less than 800° C containing grains of highly refractory material having negligible porosity and high resistance to chemical corrosion. No. 2,429,872. William Richard Downs to Corhart Refractories Company.
Method for operating sectional heat exchangers. No. 2,429,880. Fred N. Hays to Carnegie-Illinois Steel Corporation.
Wall member for heat resisting multiple-panel wall for enclosing furnaces. No. 2,429,949. Howard C. Thayer to Quigley Company, Inc.
Forming insulating material. No. 2,430,123. Ezekial J. Jacob.
Tool for lining pipes. No. 2,430,273. Harry Browning to E. I. du Pont de Nemours & Company.
Manufacturing cementitious pipe. No. 2,430,411. Ernest Wayne Rembert to Johns-Manville Corporation.
Apparatus for conducting gaseous conversion in presence of particle form solid contact material. No. 2,430,420. Louis P. Evans to Socony-Vacuum Oil Company, Inc.
Apparatus for separating dust from air stream. No. 2,430,448. Raymond Breckheimer to Rockwell Manufacturing Company.
Dry powder fire-extinguisher. No. 2,430,470. Michael E. Keefe, Jr. and Ida K. Keefe.
Treating brick comprises boiling brick for predetermined period in aqueous mixture containing magnesium carbonate, abestos, potassium cyanide, potassium nitrate, boric acid and barium hydroxide. No. 2,430,647. Harvey S. Rader.
Apparatus for prevention of leakage in gas generators. No. 2,430,652. Joseph Herbert Smith to Humphreys & Glasgow, Limited.
Rotary colloidal and homogenizing mill. No. 2,430,768. Robert C. Hopkins.

Canadian

Nylon fibres containing incorporated therein the water-insoluble condensation product of formaldehyde and a derivative of cyanamide and dyed with a direct cotton dyestuff. No. 445,739. Courtaulds Ltd. (James Hutchison MacGregor.)
Manufacture of threads by projecting an aqueous solution of alkali alginate into a coagulating bath. No. 445,738. Courtaulds Ltd. (Ronald Bertram Hall.)

Explosives

Safety explosive comprising particles of ammonium nitrate and tetrapenaerythritol decanitrate in monor proportion disposed as coating over particles, serving as sensitizer therefor. No. 2,429,573. Joseph A. Wyler to Trojan Powder Company.
High brisant explosive of decreased shock sensitiveness, comprising mixture of tetraintrate of pentaerythrite and 0.1% of a stearate of pentaerythrite as phlegmatizing agent. No. 2,429,239. Hans Muller to Schweiz, Sprengstoff Fabrik A. G.
Detonating explosive composition consisting of colloided nitrostarch-trinitrotoluene mixture comprising trinitrotoluene and from 20% to 60% of nitrostarch. No. 2,430,274. Robert W. Cairns to Hercules Powder Company.

Food

Pectinized sugar composition. No. 2,429,660. Alexander M. Zenzes.
Aqueous non-alcoholic flavoring solution containing per liter, 10-15 grams of vanillin, 0-2 grams of coumarin, one member of group consisting of Na_2HPO_4, $Na_2C_4H_4O_6$, $Na_3C_6H_5O_7$ and reactants forming some, balance water. No. 2,429,907. Frederick J. Zimmermann and Maurice Kayner to Salvo Chemical Corporation.
Making dried starch conversion syrup solids. No. 2,429,964. Herman H. Shopmeyer and Fred J. Hammerstein and General W. Larmouth to American Maize-Products Company.
Stable, noninverting nonhydroscopic, solid sugar composition. No. 2,429,251. Alexander M. Zenzes.
In treatment of sugar composition, subjecting sugar composition in solution to action of chloride in presence of elemental chlorine. No. 2,430,262. George P. Vincent to the Mathieson Alkali Works, Inc.
Lecithinated sugar. No. 2,430,553. Frank E. Gigelow.
Converting non-fibrous food solution into "dry-to-the-touch" state. No. 2,430,797. Alexander M. Zenzes.

Canadian

Obtaining starch from corn by steeping, subjecting to mill house operations yielding a mixture of starch, gluten and water, centrifuging and subjecting the overflow to a de-aerating and flotation operation whereby gluten is skimmed from the top of the liquid. No. 445,856. Corn Products Refining Co. (Fred Otto Giesecke.)

Inorganic

Preparing hydrated iron oxide, includes adding oxidized iron ammonium fluoride containing not over 40% of water to aqueous ammonia. No. 2,429,209 Perry Ellsworth Mayer to The Sherwin-Williams Company.

Catalyst consisting of aluminum chloride supported on surfaces of granules of carrier consisting of granular chloride of metal selected from left-hand column of Group 1 of Periodic System. No. 2,429,232. John W. Latchum, Jr. and Armand D. Pickett and Gerald B. Evans to Phillips Petroleum Company.

Producing dry, easily pulverized xerogel. No. 2,429,319. Kenneth K. Kearby to Standard Oil Development Company.

Producing purified sulphur from sulphur associated with finely divided gangue. No. 2,429,477. Arthur B. Menefee and Herbert H. Greger.

Preparation of natural calcium hypochlorite comprises reacting basic calcium hypochlorite free from uncombined lime with aqueous hypochlorous acid solution free from chloride ion. No. 2,429,531. Edward C. Soule and Homer L. Robson to The Mathieson Alkali Works, Inc.

Producing protein-polyphosphate compound. No. 2,429,579. Artemy A. Horvath to Hall Laboratories, Inc.

Aluminum salt of hydroxychloranic acid. No. 2,429,899. Clarence W. Sondern and Richard H. Herbine to White Laboratories, Inc.

Apparatus for treatment of hydrogel. No. 2,430,145. Mark Shoeld to The Davison Chemical Corporation.

Producing alkali metal selenide. No. 2,430,255. William T. Stewart to California Research Corporation.

Producing calcium chromite. No. 2,430,261. Marvin J. Udy.

Ammoniating acid treated clay. No. 2,430,289. Wright W. Gary to Filtrol Corporation.

Producing activated silica absorbing material for treating water containing silica in solution to remove dissolved silica. No. 2,430,300. Thomas U. Pankey and Carroll E. Imhoff to Allis-Chalmers Manufacturing Company.

Producing coatings upon iron group metals comprising electrolyzing iron group metal anodically in solution having pH of from 4.2 to 5.9, containing from 75 to 450 grams per liter of lead sulfamate. No. 2,430,304. Ernest W. Schweikher to E. I. du Pont de Nemours & Company.

Electrolytic alkali chlorine cell. No. 2,430,374. Kenneth E. Stuart to Hooker Electrochemical Company.

Treating argillaceous material to produce lightweight aggregate. No. 2,430,601. John B. Cleary to American Aggregate Company.

Producing tungsten sulphide-containing catalyst by chemical precipitation of tungsten sulfide in acidic aqueous solution from solution containing tungstate compound dissolved therein. No. 2,430,632. Lloyd C. Fetterly to Shell Development Company.

Producing composition for catalyzing reactions between organic compounds, comprises impregnating silica get having initial content of 3% to 15% by weight of water with sulfur trioxide to unite with water get to form concentrated sulfuric acid in pores of gel. No. 2,430,803. Frank G. Ciapetta to The Atlantic Refining Company.

Canadian

Method of manufacturing a freely flowing powder consisting mainly of aluminum. No. 445,750. The General Electric Company, Ltd. (Ralph Clark Chirnside and Leonard Arthur Dauncey).

Producing potassium hydroxide of high purity from a solution containing potassium hydroxide and not more than about 1 per cent of potassium chloride. No. 445,882. Innis, Speiden & o. (Edward Thorndike Ladd).

Process of producing calcium sulphate hemihydrate of predetermined consistency and setting characteristics. No. 445,983. United Gypsum Co. (Harry K. Linzell).

Improvement in the art of manufacturing magnesium chloride. No. 446,011. International Minerals & Chemical Corp. (Harold Lundin).

Process for gaining ammonium nitrate. No. 446,179. The Solvay Process Co. (Richard C. Datin).

Medicinal

p-Aminobenzene-sulfonamides and their manufacture. No. 2,429,207. Henry Martin and Rudolf Hirt to J. R. Geigy A. G.

Manufacture of 1-d-ribitylamino-3,4-xylol. No. 2,429,244. Hans Spiegelberg to Hoffmann-La Roche, Inc.

Pharmaceutical product effective by oral administration comprising, all of water-soluble oestrogenically orally active substances contained in unhydrolyzed equine urinary liquids. No. 2,429,398. Arthur Stanley Cook and Gordon A. Grant to Ayerst, McKenna & Harrison, Ltd.

Film-forming medicinal preparation for topical application to form tough, pliable, elastic, and protective film in situ comprising 1.5 to 10% by weight of sulfa drug, 4 to 30% triethanolamine, 2½ to 6.5% methyl cellulose, water, composition having viscosity between 5 and 95 poises. No. 2,429,404. James Kenneth Dixon and Russell L. Morgan to American Cyanamid Company.

Estrogenic compounds, hydroxy substituted triphenyl vinyl halides. No. 2,429,556. Charles F. Longfellow and Arnold O. Jackson to G. W. Carnrick Company.

Antacid composition consisting of 3 parts by weight of glycine and 7 parts by weight of precipitated chalk. No. 2,429,596. Harold A. Abramson.

N[1] (alpha, alpha-dimethyl-, beta-phenyl-propionyl) sulfanilamides. No. 2,429,835. Henry Martin and Hans Gysin to J. R. Geigy A. G.

Preparing tetraacetyl ribonic acid comprises reacting, at temperature below room temperature salt of ribonic acid and acetic anhydride, reaction carried out in presence of gaseous hydrogen halide. No. 2,429,937. Kurt Ladenburg, Robert Babson, and Max Tishler to Merck & Co., Inc.

Preparing therapeutic zinc peroxide of satisfactory gas evolution rate and high activity. No. 2,429,971. James H. Young to E. I. du Pont de Nemours & Company.

Sulfanilamide derivative selected from group consisting of those represented by formula described in patent. No. 2,430,051. Moses Wolf Goldberg and Stephen Dannie Heineman to Hoffmann-La Roche, Inc.

Compound selected from 5-sulfanilamido-3,4-dimethyl-isoxazole,5-sulfanilamido-3-oxymethyl-4-methyl-isoxazole, and 5-sulfanilamido-3-ethyl-4-methyl-isoxazole, and alkali metal salts thereof. No. 2,430,094. Heinz M. Wuest and Max Hoffer to Hoffmann-La Roche, Inc.

Non-aqueous antiseptic liquid composition, comprising pure urea peroxide dissolved in glycerol. No. 2,430,450. Ethan Allan Brown, Manuel H. Gorin and Harold A. Bramson.

Preparing vitamin A ethers. No. 2,430,493. John D. Cawley to Distillation Products, Inc.

Therapeutic dressing comprising in combination therapeutically active filamentary fibers having form of cotton and made from boric acid and therapeutically inert fibers thoroughly mixed therewith. No. 2,430,740. Arthur E. Sharples.

Canadian

Method of manufacturing derivatives of para-amino benzene sulphonamides substituted in the sulphamido group by heterocyclic residues. No. 445,845. Ward Blenkinsop and Co., Ltd. (Bertold Paul Heinrich Wiesner and Ernst Katscher).

Metals, Ores

Refining grain structure of aluminum-containing magnesium-base alloys, comprises bringing such alloy into contact with silicon carbide, aluminum carbide, or manganese carbide while alloy is in molten condition. No. 2,429,221. James A. Davis to The Battelle Development Corporation.

Furnace for sintering metallic ores having fusion hearth therein. No. 2,429,372. John A. Savage.

Removing zinc from copper base alloys. No. 2,429,584. Frank F. Poland to Revere Copper and Brass, Incorporated.

Producing low carbon ferrochrome from high content chrome ore. No. 2,429,648. Ivar Rennerfelt and Bo Mikael to Sture Kalling.

Treating metallic selenium surface comprises making selenium an anode in chromic acid solution. No. 2,429,655. Arthur von Hippel and James H. Schulman to Federal Telephone and Radio Corporation.

Metallurgical furnace for vacuum production of readily vaporized metals such as magnesium. No. 2,429,668. Hugh S. Cooper to Acme Aluminum Alloys, Inc.

Treatment of materials containing tantalum and niobium for obtaining separation of niobium from tantalum. No. 2,429,671. Francois Cuvelliez.

Electrolyte for use in anodic polishing of nickel comprising 5 to 85% by weight sulfuric acid, 5 to 85% orthophosphoric acid, 0.5 to 2.6% trivalent aluminum, 0.5 to 1.4% trivalent chromium, balance comprising water. No. 2,429,676. Charles L. Faust to Battelle Memorial Institute.

Production of shaped bodies containing iron oxide for removal of hydrogen sulphide from gases. No. 2,429,759. Gerlad Uern Hopton to The Gas, Light and Coke Company.

Heat treating surface or surface portion of each of series of articles. No. 2,429,776. Albert Edward Shorter to The Linde Air Products Company.

Forgeable and machineably-alloy steel. No. 2,429,800. Janet Z. Briggs to Crucible Steel Company of America.

Electric furnace for melting magnesium and its alloys. No. 2,429,959. John S. Peake and George T. Sermon to The Dow Chemical Company.

Producing bright silver electrodeposits, comprises electrolyzing silver-alkali metal cyanide solution containing organic sulfur compound selected from 2-mercaptobenzothiazole, 2-mercaptothiazole, 2-merchaptothiazoline, thioacetanilide and trimercaptocyanuric acid to brighten deposit within range of 0.01 to 1 ounce per gallon. No. 2,429,970. Christian J. Wernlund and James R. Macon to E. I. du Pont de Nemours & Company.

Production of stainless steel having chromium content of 10% to 30%, carbon content not exceeding 0.2%. No. 2,430,117 Alexander L. Feild to The American Rolling Mill Company.

Production of stainless steel of carbon content not exceeding 0.10% in electric arc furnace. No. 2,430,131. Donald L. Loveless to The American Rolling Mill Company.

Precipitation hardenable copper nickel, tantalum (or columbium) alloys. No. 2,430,306. Cyril Stanley Smith to The American Brass Company.

Cyclic process for recovering manganese values from manganese dioxide ore. No. 2,430,346. John Koster to Crimora Research and Development Corporation.

Condensation of metallic vapour. No. 2,430,389. William Frederick Chubb.

Silver plating predominantly aluminum body. No. 2,430,468. Edward M. Julich and William A. Mehmel to Bell Telephone Laboratories, Incorporated.

Production of stainless steel of appreciable columbium content. No. 2,430,671. Alexander L. Feild to The American Rolling Mill Company.

Differential froth flotation of chalcopyrite-sphalerite ores. No. 2,430,778. Samuel Payne Moyer to American Cyanamid Company.

Canadian

Producing metallic magnesium by first reducing MgO in and then sharp quenching the vapours to by means of atomized oil. No. 445,872. Ford Motor Company of Canada, Ltd. (Russell Hudson McCarroll and Joseph Stanley Laird).

Process for recovering cobalt from cobalt-containing material having nickel and appreciable amounts of iron and copper present. No. 446,289. The International Nickel Co. of Canada, Ltd. (Louis S. Renzoni).

Organic

Tertiary butyl derivative of hemimellitene and process for preparing. No. 22,930. Marion Scott Carpenter to Givaudan-Delawanna, Inc.

Manufacture of hydrogen cyanide comprises injecting into stream of formamide vapour solution of substance selected from phosphoric acid and compounds yielding phosphoric acid by thermal decomposition, heating to 300°-700° C., cooling. No. 2,429,262. Leonard Fallows and Eric Vernon Mellers to British Celanese, Limited.

Slowly adding sulfuric acid to rosin and stirring at atmospheric pressure and heating at 180° to 200° C. for two hours. No. 2,429,264. Elmer E. Fleck.

Alkamine derivatives of ortho aminomethyl benzoic acid. No. 2,429,275. Robert P. Parker and Arthur J. Hill to American Cyanamid Company.

In bleaching of shellac, improvement comprises subjecting shellac in alkaline aqueous solution to action of water-soluble chlorite in presence of aldehyde, alkalinity of solution being sufficient to maintain shellac in solution. No. 2,429,317. Clifford A. Hampel to The Mathieson Alkali Works, Inc.

Condensing alkyl ketone in presence of catalyst comprising composite of alumina and oxide of element selected from members of left hand column of group VI of periodic table. No. 2,429,361. Carl B. Linn and Vladimir N. Ipatieff to Universal Oil Products Company.

Reacting 2,3-dimethylbutene and chloromethyl methyl ether to form methoxy chloroheptane, dehydrochlorinating methoxy chloroheptane to form methoxyheptene, hydrogenating and hydrogenolyzing the latter to form 2,2,3-trimethylbutane. No. 2,429,373. Louis Schmerling to Universal Oil Products Company.

Bis(carboxy methyl propyl) sulfide. No. 2,429,391. Oliver W. Cass to E. I. du Pont de Nemours & Company.

Bis(amino methyl propyl) sulfide. No. 2,429,392. Oliver W. Cass to E. I. du Pont de Nemours & Company.

1-Alkoxy-2,4-pentadienes and substituted derivatives thereof. No. 2,429,411. Ewart Ray Herbert Jones and John Talbot McCombie to Imperial Chemical Industries, Limited.

Preparation of reaction products of primary and secondary alkylolamines. No. 2,429,445. Harland H. Young and David Rubinstein to Industrial Patent Corporation.

Bis (cyano methyl propyl) sulfide. No. 2,429,452. Oliver W. Cass to E. I. du Pont de Nemours & Company.

Production of vinyl cyanide comprises subjecting succinonitrile vapor to pyrolysis at 300°C to 700°C in presence of inert material. No. 2,429,-459. Charles R. Harris to E. I. du Pont de Nemours & Company.

Production of vinyl cyanide by reacting acetylene with hydrocyanic acid at 450°C to 550°C in presence of an alkali metal or alkaline earth metal cyanides. No. 2,429,460. Charles R. Harris and William C. Sharples to E. I. du Pont de Nemours & Company.

Thioketones containing a cycloalkyl group. No. 2,429,469. Grafton H. Keyes to Eastman Kodak Company.

Improved process for production of 2,6-nitro chlor benzyl bromide from 2,6-nitro chlor toluene. No. 2,429,493. Frederic Sievenpiper and Lawrence H. Flett to Allied Chemical & Dye Corporation.

Production of cyclopentane carboxaldehyde from cyclohexene. No. 2,429,-501. Harry Louis Yale and George W. Hearne to Shell Development Company.

A p-alkylaminobenzamide having structural formula described in patent. No. 2,429,535. Alexander R. Surrey to Winthrop Chemical Company, Inc.

Carbocyanines from alicyclicdioxy azoles. No. 2,429,574. Alfred W. Anish and Lee C. Hensley to General Aniline & Film Corporation.

Benzene alkylation using ethyl alcohol and benzene charging stock. No. 2,429,622 Joel H. Hirsch to Foster Wheeler Corporation.

Separating amino acids from each other to increase proportion of one with respect to another amino acid. No. 2,429,666. Richard J. Block to C. M. Armstrong, Inc.

Meta-di-tert-butylbenzene. No. 2,429,691. Carl E. Johnson and Chester E. Adams to Standard Oil Company.

Producing unsaturated dimer of alpha alkyl styrene, comprises contacting alpha alkyl styrene with sulfuric acid of 30% to 65% concentration at 150°F to 220°F. No. 2,429,719. Arthur B. Hersberger and Randall G. Heiligmann to The Atlantic Refining Company.

Making isopropyl chloride comprises bringing gaseous hydrogen chloride and propylene into contact with granular anhydrous calcium sulfate. No. 2,429,758. Frank C. Holmes to Ethyl Corporation.

2,2,4-trichlorobutyramide. No. 2,429,791. Oscar W. Bauer and John W. Teter to Sinclair Refining Company.

Production of delta-valerolactone comprises reacting substance taken from group consisting of delta-hydroxyvaleric aldehyde and epoxy 1-5 pentanol-5 with oxygen at 80°C to 100°C. No. 2,429,799. John George Mackay Bremner, David Gwyn Jones and Arthur William Charles Taylor to Imperial Chemical Industries, Limited.

Amination catalyst consisting of 40-60% by weight calculated as metallic cobalt of reduced cobalt oxide supported on carrier of synthetic magnesium silicate. No. 2,429,855. John W. Teter to Sinclair Refining Company.

Catalytic hydrogenation of aminoacetonitrile to ethylene diamine. No. 2,429,876. William F. Gresham to E. I. du Pont de Nemours & Company.

Preparation of N,N-dilower alkyl alpha keto aliphatic monobasic acid amide. No. 2,429,877. William F. Gresham to E. I. du Pont de Nemours & Company.

Synthesis of organic oxygen-containing compounds comprises reacting simultaneously, in presence of hydrogenation catalyst and dialkyl ether, dialkyl formal, carbon monoxide and hydrogen. No. 2,429,878. William F. Gresham and Richard E. Brooks to E. I. du Pont de Nemours & Company.

Alkyl-dialkylaminosilanes. No. 2,429,883. Oscar Kenneth Johannson to Corning Glass Works.

Preparation of N-alkyl di-(beta-(alkoxymethoxy)alkyl) amines, comprises subjecting di(beta-(alkoxymethoxy)alkyl) amine to reaction with alkyl sulfate and aqueous solution of substance selected from alkali metal and alkaline earth metal hydroxides and carbonates. No. 2,429,886. Donald J. Loder to E. I. du Pont de Nemours & Company.

Carrying out Friedel-Crafts alkylations of aromatic compounds to conserve catalyst with reactants tending to deactivate catalyst. No. 2,429,-887. George L. Magoun to Monsanto Chemical Company.

Preparing polychlorinated saturated aliphatic hydrocarbons from gaseous saturated aliphatic hydrocarbons and chlorine in single operation. No. 2,429,963. Otto Reitlinger.

Chlorinating phthalic anhydrides comprises reacting elemental chlorine with phthalic anhydride in presence of chloride of molybdenum as catalyst. No. 2,429,985. Paul W. Blume, Gerald A. Thomas and Gervais Baillio to Niagara Alkali Company.

Certain dicarboxy acid esters of oxyalkylated polymerized hydroxyamines. No. 2,430,004. Melvin De Groote and Bernhard Keiser to Petrolite Corporation, Ltd.

4-Methyl-5-imidazolone -(2)-caproic acid and esters thereof. No. 2,430,-006. Robert Duschinsky to Hoffmann-La Roche, Inc.

Conversion of 1,2-dihalobutene-3 to 2-halobutadiene-1,3 comprises treating 1,2-dihalobutene-3 with aqueous solution of alkali at boiling temperature of 2-halobutadiene-1,3 which is produced. No. 2,430,016. George W. Hearne and Donald S. La France to Shell Development Company.

Converting soluble tall oil soaps into tall oil, step which consists in reacting soaps in aqueous solution with sulfur dioxide gas until pH of mixture is brought below 5, in presence of sodium bisulfite in excess of that formed in occurring reaction. No. 2,430,029. Arthur Pollak, Paul C. Chapman and Randall Hastings to West Virginia Pulp and Paper Company.

Composition containing glyceride subject to oxidative change and small amount of reaction product of betaine amide, sugar, and fatty acid as antioxidant to protect glyceride against oxidative change. No. 2,430,031. Sol Shappirio.

Char revivification apparatus including means for reclaiming and re-utilizing heat from cooling section. No. 2,430,056. Robert Sayre Kent.

Concentrating aqueous water soluble lower aliphatic acid. No. 2,430,086. Charles E. Staff to Carbide and Carbon Chemicals Corporation.

Alkamine esters of oxy substituted diarylhydroxyacetic acids. No. 2,430,-116. Roger B. Holmes and Arthur J. Hill to American Cyanamid Company.

Continuous process for manufacture of 1-methylcyclohexene-1 and 4-methylcyclohexene-1 from propylene. No. 2,430,137. Alex G. Oblad and Everett Gorin to Socony-Vacuum Oil Company, Inc.

New composition of matter, low-softening point, amorphous, reaction product, prepared by admixing one mol part of benzothiazyl disulfide with two mol parts of member selected from ditolyl guanidine, phenyl, tolyl guanidine, diphenyl guanidine, mixtures thereof and mixtures containing at least one of these guanidines and dixylyl guanidine. No. 2,430,162. Arnold R. Davis to American Cyanamid Company.

New chemical compound product of condensation reaction between algin and protein. No. 2,430,180. Victor Charles Emile Le Gloahec to Algin Corporation of America.

Alkylating phenols comprises reacting phenol with olefin in presence of alkyl halide and solid oxide contact material selected from silica and alumina. No. 2,430,190. Louis Schmerling and Vladimir N. Ipatieff to Universal Oil Products Company.

Stable, active halogen-yielding nonaqueous mixture of hydantoins. No. 2,430,233. Paul La Frone Magill to E. I. du Pont de Nemours & Company.

Catalytic cracking of partially oxidized hydrocarbons. No. 2,430,249. Robert F. Ruthruff.

Benzoate of an N-pyrryl alkanol. No. 2,430,268. Souren Avedikian to The National Drug Company.

Separating liquid mercaptans from mixtures with liquid hydrocarbons. No. 2,430,269. Richmond T. Bell to The Pure Oil Company.

Preparing organic mercury phenolates comprises acting upon inorganic mercuric compound capable of ionizing in acid media with tetrahydrocarbon lead and phenol. No. 2,430,287. Albert L. Flenner to E. I. du Pont de Nemours & Company.

Production of dichloropropylenes having chlorine atoms in allyl and vinyl positions. No. 2,430,326. Harry A. Cheney and Sumner H. McAllister to Shell Development Company.

Production of ether comprises subjecting aliphatic monohydric alcohol to action of anhydrous hydrofluoric acid, etc. No. 2,430,388. Paul H. Carnell to Phillips Petroleum Company.

Aromatization of oil produced in low temperature carbonization of coal. No. 2,430,416. Charles Weizmann to Ketarome, Limited.

Removal of dinitroxylenes from mixtures containing minor amounts thereof with mononitroxylenes. No. 2,430,421. William P. Gage to Shell Development Company.

Plasticized composition comprising plasticizable organic substance and fatty acid ester of styrene glycol. No. 2,430,424. Carroll A. Hochwalt and Charles A. Thomas to Monsanto Chemical Company.

Prevention of thinning of carbohydrate printing pastes containing diazonium salts with olefin carboxylic acid amides. No. 2,430,430. Roy H. Kienle and Frederic H. Adams to American Cyanamid Company.

Catalytic conversion of methane and steam to hydrogen and oxides of carbon. No. 2,430,432. Milton M. Marisic to Socony-Vacuum Oil Company, Inc.

Preparing 4-methyl-4-methoxy-2-pentanone by reaction of mesityl oxide with methyl alcohol. No. 2,430,436. John B. Tindall to Commercial Solvents Corporation.

P-substituted benzene sulfonamido pyrimidine compound having formula described in patent. No. 2,430,439. Philip Stanley Winnek and Richard O. Roblin, Jr., to American Cyanamid Company.

Producing olefin oxides. No. 2,430,443. Sam B. Becker to Standard Oil Company.

Reaction products of s-benzyl penicillamines and g-penaldates and process for making. No. 2,430,455. Harry Means Crooks, Jr., to Parke, Davis & Company.

New 1,3,5-triazine compound. No. 2,430,461. Ernst A. H. Friedheim.

Producing 1,3,5-triazine compound. No. 2,430,462. Ernst A. H. Friedheim.

3-Amino-derivatives of steroids and method of making. No. 2,430,467. Percy L. Julian, John W. Cole, Arthur Magnani and Edwin W. Meyer to The Glidden Company.

Catalytic alkylation of aromatic hydrocarbons by normal paraffins. No. 2,430,516. Arthur P. Lien and Bernard H. Shoemaker to Standard Oil Company.

Recovering oil from high oil-content vegetable seeds or nuts. No. 2,430,-535. Edward W. Schmidt and William F. Webber to Archer-Daniels-Midland Company.

Preparing triethyl phosphate comprises treating ethyl metaphosphate with ethyl butyral. No. 2,430,569. David C. Hull and Albert H. Agett to Eastman Kodak Company.

Reacting chlorine with solution of furane in saturated chlorohydrocarbon at below 0°C warming reaction mixture to not higher than 20°C until all hydrogen chloride is driven off. No. 2,430,667. Oliver W. Cass and Harry B. Copelin to E. I. du Pont de Nemours & Co.

Bleaching of non-cellulosic organic materials, improvement comprises subjecting material to action of non-acidic aqueous solution of chlorite of metal of group consisting of alkali and alkaline earth metals in presence of aldehyde. No. 2,430,674. Clifford A. Hampel to The Mathieson Alkali Works, Inc.

In bleaching of material comprising fatty acid compounds, improvement comprises admixing material with water soluble chlorite in presence of water and aldehyde at pH not less than about 7. No. 2,430,675. Clifford A. Hampel to The Mathieson Alkali Works, Inc.

5-amino-6-methoxy-8-quinoline thiol having formula described in patent. No. 2,430,678. Glenn L. Jenkins and John E. Christian to Purdue Research Foundation.

5,5'-diamino-6,6'-dimethoxy-8,8'-diquinolyl disulfide having formula described in patent. No. 2,430,679. Glenn L. Jenkins and John E. Christian to Purdue Research Foundation.

Reaction products of aldehydes and triazine derivatives. No. 2,430,708. Gaetano F. D'Alelio to General Electric Company.

Germicidal preparation comprising 3-methylol-2(3)-benzothiazolinethione and carrier selected from powdered solid carriers and water containing dispersing agent. No. 2,430,791. William P. ter Horst to United States Rubber Company.

Purifying 3-picoline contaminated by at least one of bases 4-picoline and 2,6-lutidine, consists in heating contaminated 3-picoline with compound of the class consisting of aliphatic and aromatic organic-acid anhydrides and aliphatic and aromatic organic-acid halides. No. 2,430,804. Francis E. Cislak and William R. Wheeler to Reilly Tar & Chemical Corp.

3-monoallylaminosulfolane of structural formula described in patent. No. 2,430,821. Rupert C. Morris and Alva V. Snider to Shell Development Company.

Chlorinated isopropyl benzene in which chlorine atom has been substituted for hydrogen on each side chain carbon atom. No. 2,430,822. John A. Nevison to The Atlantic Refining Company.

Cyanine salt wherein anion is negative radical of sulfamic acid. No. 2,430,845. Edmund B. Middleton to E. I. du Pont de Nemours & Company.

Canadian

Process for the recovery of ortho-xylene from a sulphuric acid-washed drip oil fraction. No. 445,709. Allied Chemical & Dye Corp. (Percy J. Cole).

Process of separating 3-picoline, 4-picoline, and 2,6-lutidine. No. 445,771. Reilly Tar & Chemical Corp. (Francis E. Cislak and Frank A. Karnatz).

Process of separating tar acids from coal tar. No. 445,772. Reilly Tar & Chemical Corp. (Francis E. Cislak and Thomas Patrick Carney).

Process for the production of diacetyl from methyl ethyl ketone. No. 445,781. Shell Development Co. (George W. Hearne and Vernon W. Buls).

Method of preparing a cyanoaminobenezenesulphonamide. No. 445,980. Canadian General Electric Company, Ltd. (Gaetano F. D'Alelio and James J. Pyle).

Additional patents from the above volumes will be given next month.

Trademark of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

433,663. No-Flame Chemical Corporation, Los Angeles, Calif., assignor to Frank L. Shaw and Cora H. Shaw, Los Angeles, Calif.; filed Oct. 1, 1946; Serial No. 513,600; for prepared chemicals used in impregnating materials for flameproofing, preserving and preventing moths and termites from attacking treated material; since Jan. 15, 1940.

433,666. Phil-Mar Prod Co., Cleveland, O.; filed Feb. 18, 1947; Serial No. 517,744; for plastic coated glass fabric, since Nov. 1, 1945.

434,245. Clarence R. Tex, Toledo and Woodville, Ohio, filed May 20, 1946; Serial No. 502,-458, combinations of chemical ingredients for use in soil conditioning; since Feb.., 1935.

477,916. Continental Can Company, Inc., New York, N. Y., filed Dec. 26, 1944; for containers; since Nov. 11, 1944.

489,572. Eastern Corp., Bangor, Maine, filed Oct. 8, 1945; for paper adapted to be coated and/or impregnated with synthetic resins and/or plastic materials; since July 26, 1945.

493,141. National Tube Company, Pittsburgh, Pa., filed Dec. 12, 1945; for empty metal containers; since Nov. 15, 1937.

497,985. Aridye Corporation, New York, N. Y., assignor to Interchemical Corporation, New York, N. Y., corp. of Ohio, filed Mar. 11, 1946; for dyestuffs; since Feb. 6, 1946.

499,038. Animal Trap Company of America, Lititz, Pa., filed Mar. 27, 1946; for poisons for insects, rodents; since Feb. 11, 1946.

501,657. Geigy Co., Inc., N.Y., filed May 8, 1946; for dyestuffs; since Jan. 24, 1939.

503,064. Eason Morgan Company, Nashville, Tenn., filed May 31, 1946; for insecticides; since Apr. 1, 1946.

503,174. Selectronic Dispersions, Inc., Montclair, N. J., filed June 1, 1946; for plastic compounds, since May 16, 1946.

503,399. Standard Oil Company, Whiting, Ind., and Chicago, Ill., filed June 6, 1946; for butylene polymers; since Apr. 10, 1946.

503,848. Jacques Wolf & Co., Clifton, N. J., filed June 13, 1946; for emulsifier which is special condensate of poly-glycol with fatty acid or oils of non-ionic type; since Aug. 28, 1942.

507,087. Tykor Products, Inc., New York, N. Y., filed Aug. 8, 1946; for concentrated chlorine bearing powder; since July 1, 1945.

507,485. Panther Oil & Grease Mfg. Co., Fort Worth, Tex., filed Aug. 15, 1946; for lubricating oils and greases; since Oct. 1, 1922.

507,487. Panther Oil & Grease Mfg. Co., Fort Worth, Tex., filed Aug. 15, 1946; for lubricating oils and greases; since Oct. 1, 1922.

509,850. Carl Johnson Co., Dallas, Tex., filed Sept. 27, 1946; for pulverized powder having polishing characteristics used in rubbing down wax and polish coats; since May 2, 1946.

512,149. The Brooks Boiler Treatment Company, Cleveland, Ohio, filed Nov. 7, 1946; for removing soot and carbon; since 1941.

513,312. The International Nickel Co., Inc., New York, N.Y.; filed Nov. 27, 1946; for nickel-containing cast iron; since Nov. 6, 1946.

513,607. Chemical Sales Corporation, Buffalo, N. Y., filed Dec. 3, 1946; for granular preparation for adsorbing oil and grease; since about Oct. 28, 1946.

513,855. The Titanium Alloy Mfg. Co., Niagara Falls, N.Y., filed Dec. 6, 1946, for zirconium dioxide; since Aug. 26, 1943.

515,135. Sun Chem. Co., New York, N.Y., filed Dec. 31, 1946; for treated petroleum microcrystalline wax; since May 27, 1946.

515,876. The Harshaw Chem Co., Cleveland, O., filed Jan. 17, 1947; for addition agents in electroplating solutions; since Oct. 4, 1946.

515,887. MacDermid Incorporated, Waterbury, Conn., filed Jan. 17, 1947; for liquid addition agent for cyanide copper plating; since June 24, 1944.

516,984. Herron Bros. & Meyer, New York, N. Y., filed Feb. 5, 1946; for high modulus, low capacitance, organic compounding ingredient for use in rubber insulation for electrical wire; since June 1944.

517,348. Boston Varnish Company, Everett, Mass., filed Feb. 12, 1947; for synthetic resin; since Jan. 30, 1947.

517,349. Boston Varnish Company, Everett, Mass., filed Feb. 12, 1947; for synthetic resin; since Jan. 30, 1947.

518,602. The International Nickel Company, Inc., New York, N. Y., filed Mar. 6, 1947; for welding wire of nickel-copper alloy; since Jan. 16, 1947.

518,603. The International Nickel Co., Inc., N. Y., filed Mar. 6, 1947; for welding wire of nickel-chromium-iron alloy, since Aug. 8, 1945.

518,604. The International Nickel Company, Inc., New York, N. Y., filed Mar. 6, 1947; for welding wire of nickel; since Dec. 11, 1946.

518,759. Illinois Powder Manufacturing Company, St. Louis, Mo., filed Mar. 10, 1947, for explosive cartridges; since Oct. 30, 1946.

518,789. Standard Oil Co. of Calif, Wilmington, Del. and San Francisco, Calif., filed Mar. 10, '47; for paint thinners, solvents; since Nov. '34.

519,055. Brock Chemical Co., Inc., North Abington, Mass., filed Mar. 15, 1947; for penetrating oil preparations for dressing and waterproofing leathers; since Mar. 1, 1947.

519,408. Naco Fertilizer Co., N.Y., filed Mar. 21, 1947; for fertilizer; ince Apr. 1, 1933.

519,411. Organic Chemicals Corporation, Frederick, Md., filed Mar. 21, 1947; for insecticide; since Feb. 11, 1947.

521,035. Sun Chemical Corporation, New York, N. Y., filed Apr. 19, 1947; for printing inks; since Nov. 28, 1945.

521,083. Monsanto Chemical Company, St. Louis, Mo., filed Apr. 21, 1947; for chemical toxicants; since Sept. 25, 1946.

521,416. Sun Chemical Corporation, New York, N. Y., filed Apr. 26, 1947; for producing water repellent and/or waterproof finishes for textiles; since Apr. 8, 1947.

521,503. Cummings-Moore Graphite Co., Detroit, Mich., filed Apr. 29, 1947; for amorphous graphite ores, etc., since Mar. 15, 1947.

521,754. Robeley Laboratories, Inc., N.Y., filed May 2, 1947; for use in photographic film and printing paper; since February, 1947.

521,776. C. A. Woolsey Paint & Color Co., Inc., New York, N. Y., filed May 2, 1947; for ready-mixed paints and paint thinner for use in painting ship bottoms; since September 1946.

523,367. Celanese Corp. of Amer., N.Y., filed June 2, 1947; for piece goods made of cellulose acetate type yarns; since May 28, 1947.

523,473. National Lead Company, New York, N. Y., filed June 3, 1947; for metal containers; since Apr. 24, 1947.

523,879. Armour and Company, Chicago, Ill., filed June 7, 1947; for soap; since 1900.

524,077. Pacific Chemical Company, Los Angeles, Calif., filed June 12, 1947; for surface active agent; since May 5, 1947.

Trademarks reproduced and described include those appearing in Official Gazette of U. S. Patent Office, October 21—November 11.

433,663

PHIL·MAR ORIGINAL
433,666

FARMLYME
434,245

477,916

PLASTIBASE
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493,141

Interchem
497,985

VICTOR
499,038

GYCOLAN
501,657

TERMI NATE
503,064

ALLOID
503,174

INDOPOL
503,399

FOREMUL
503,848

Rin-Klor 50
507,087

PANTHER
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PANTHER
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MIRACOTE
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SUPER-X
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FLORIDEX
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INSULOXIDE
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CARDIS
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PERFLOW
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ROCHELTEX
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KYANAC
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PRIMAGEL
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SOCAL
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Storm-FLEX
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COMPARE RESULTS
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Orsecо
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Sun CHEMICAL CORPORATION
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BIOCIDE
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TRIPLE-SEC
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CMG CUMOGRAPH
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HYP·A·MIN
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Vinelast
521,776

CELALOOM
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NALCO
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Fine Art
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QET
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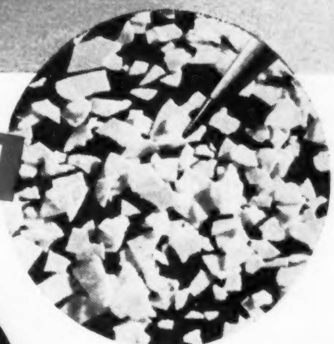
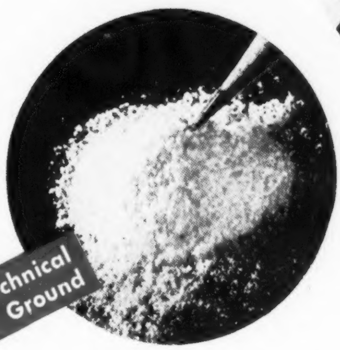
DDT

Technical Grades and
Dry Wettable Concentrates
Dust Base Concentrates
Emulsifiable Concentrates
Solvent Concentrates





General Chemical Technical Grade DDT is available in either the *finely ground* or the small, *thin flake* types that insure easy handling and processing in your milled or oil-base products. The flake type offers processing efficiencies and economies that are well worth investigating. Samples available.

General Chemical's DDT materials are developments of research, production and quality control facilities that are among the nation's foremost. This combination—together with nearly half a century of experience and leadership "in insecticides"—is your assurance that you will always obtain DDT materials of uniformly high quality on every purchase from General Chemical. For your needs . . . write or phone nearest General Chemical Office below.

GENERAL CHEMICAL DDT PRODUCTS:

DDT TECHNICAL, Finely Ground	GENITOL* EM-25 (25% Emulsifiable)
DDT TECHNICAL, Thin Flake	GENITOL EM-30 (30% Emulsifiable)
GENITOX* S-50 (50% DDT Wettable, Microfine)	GENITOL SC-30 (30% Solvent Concentrate)
GENITOX D-50 (50% Dust Base, Microfine)	GENITOL SC-40 (40% Solvent Concentrate)

*Reg. U. S. Pat. Off.

BASIC CHEMICALS FOR AMERICAN INDUSTRY

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Makers of the Nation's Foremost ORCHARD BRAND SPRAYS & DUSTS *Insecticides and Fungicides*

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